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# Design Document

for

## Sahara

Version 1.0

Prepared by

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Course: CS253

Mentor TA: Prof Dr. Indranil Saha

Date: 07/02/2025

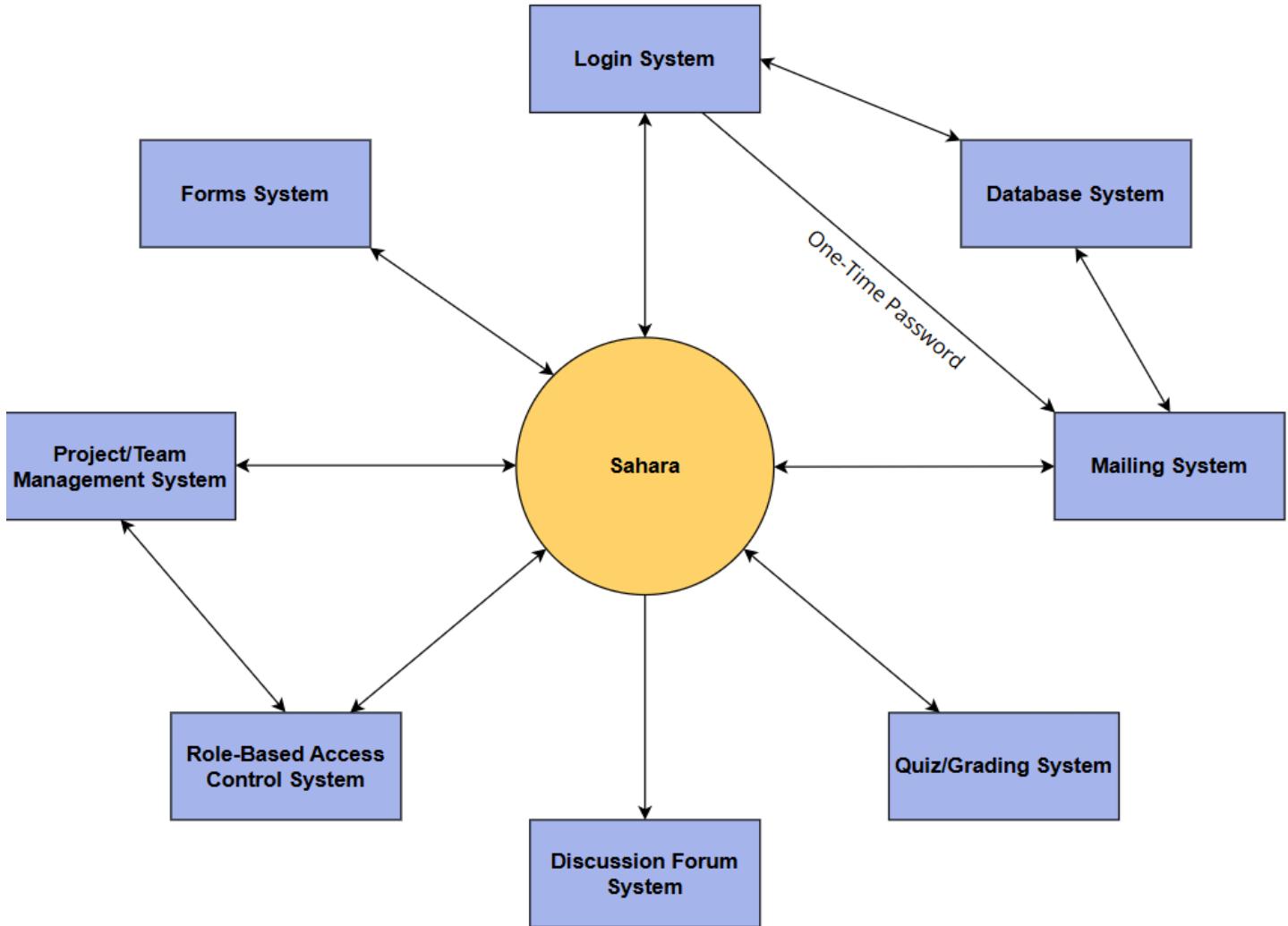
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## Revisions

Version	Primary Author(s)	Description of Version	Date Completed
Initial draft 1.1	Ravi and Friends	Initial draft of the document was created	31/01/25
Intermediate draft 1.2	Ravi and Friends	The UI section was revised and integrated into the intermediate draft	03/02/25
Final Draft 1.3	Ravi and Friends	Final Draft was completed	05/02/25

# 1 Context Design

## 1.1 Context Model



- **Login System** : This system will securely handle the task of authenticating the users and redirecting them to their respective landing pages. It will also handle the cases when the user wishes to change his/her password.
- **Mailing System** : The mailing system will be used to communicate and send notifications and send a One-Time Password for Email verification during first-time login..
- **Database System** : This system stores all information pertaining to the software like login credentials, grades etc.

- **Quiz/Grading System** : This system lets the professor and TAs upload quizzes and grade submissions made by students.
- **Discussion Forum System** : This system creates dedicated channels for various types of communication like among the team members, between a team and their mentor, general purpose etc.
- **Role-Based Access Control System (RBAC)** : This control system assigns users different levels of access or permissions based on their role.
- **Project/Team Management System** : This system handles the creation of teams, beta-testing pairs, and displays information about a team and their progress to professors and TAs.
- **Forms System**: This system would be used by the professors and TAs to collect responses from other users, and also by TAs and students to answer them.

## 1.2 Human Interface Design

### 1.2.1 Login and Sign-up Page



### 1.2.2 FORGOT PASSWORD



### 1.2.3 ENTER OTP



### 1.2.3 SET NEW PASSWORD

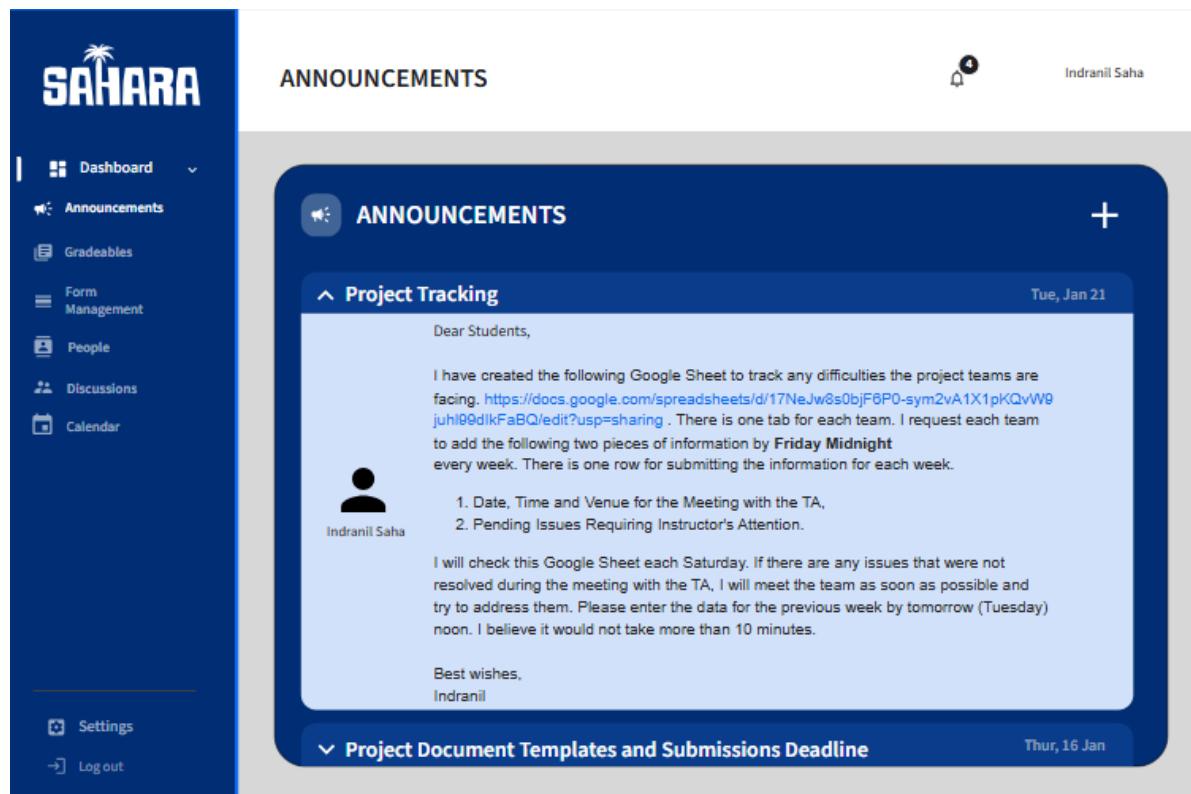


### 1.2.2 INSTRUCTOR

#### 1.2.2.1 DASHBOARD

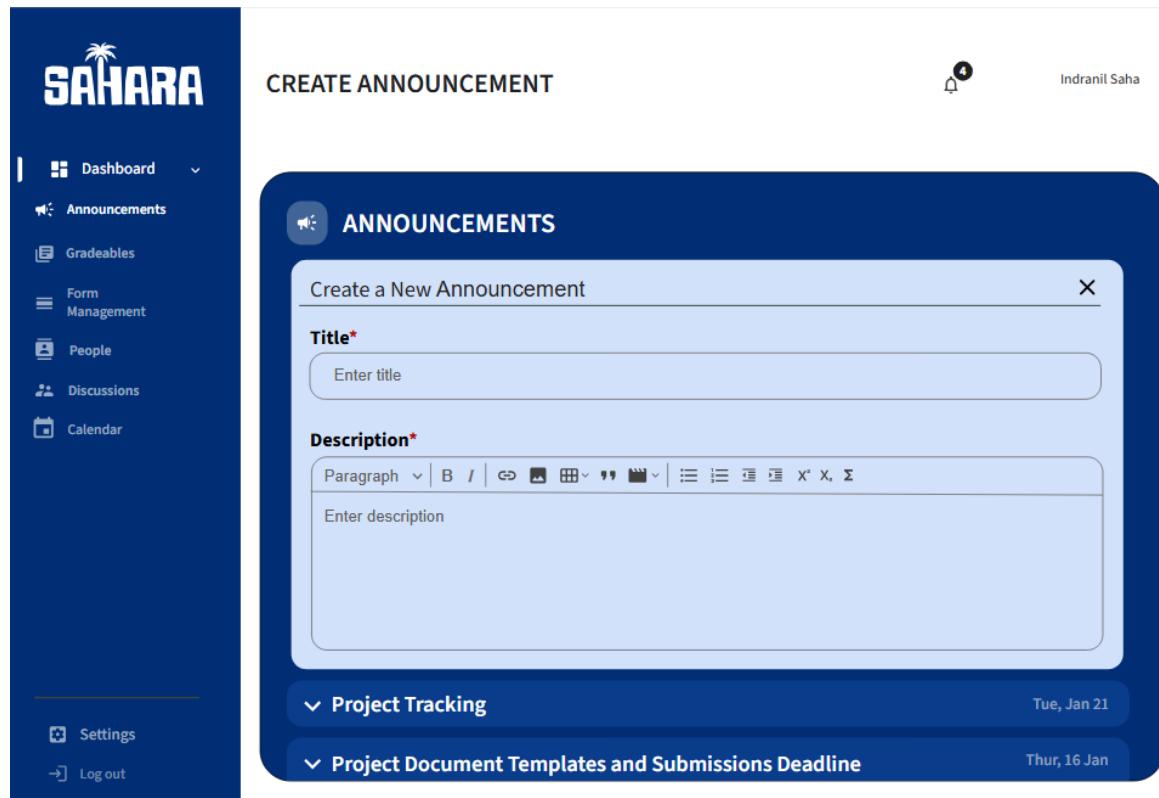
A screenshot of the SAHARA instructor dashboard. On the left is a dark sidebar with a navigation menu: "Dashboard", "Announcements", "Gradeables", "Form Management", "People", "Discussions", "Calendar", "Settings", and "Log out". The main area has a white header with the text "Welcome Back, Indranil Saha!". To the right of the header are a notification bell icon with a "4" badge, a user profile picture for "Indranil Saha", and the user's name. Below the header are two main sections: "GRADEABLES" and "FORM SUBMISSIONS", each containing "QUizzes" and "PROJECT WORK" sub-sections. The "GRADEABLES" section shows data for three quizzes and two project submissions. The "FORM SUBMISSIONS" section shows data for three quizzes and one project submission. On the far right, there is a "Notifications" sidebar listing recent notifications from "team-8", "global", and "Indranil".

### 1.2.2.2 ANNOUNCEMENTS



The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with navigation links: Dashboard, Announcements (selected), Gradeables, Form Management, People, Discussions, Calendar, Settings, and Log out. The main area has a light gray header with the word "ANNOUNCEMENTS". In the top right corner, there is a user icon and the name "Indranil Saha". Below the header is a large blue announcement card. The card has a title "ANNOUNCEMENTS" with a speaker icon. It contains a section titled "Project Tracking" with a date "Tue, Jan 21". The message body starts with "Dear Students," and discusses a Google Sheet for project tracking. It includes a list of two items: "1. Date, Time and Venue for the Meeting with the TA," and "2. Pending Issues Requiring Instructor's Attention." It also mentions checking the sheet weekly and meeting teams if issues are not resolved. The message ends with "Best wishes," and "Indranil". At the bottom of the card is a section titled "Project Document Templates and Submissions Deadline" with a date "Thur, 16 Jan".

### 1.2.2.3 CREATE ANNOUNCEMENTS



The screenshot shows the SAHARA software interface. The left sidebar is identical to the previous screenshot. The main area has a light gray header with the word "CREATE ANNOUNCEMENT". In the top right corner, there is a user icon and the name "Indranil Saha". Below the header is a large blue modal window titled "ANNOUNCEMENTS". The modal has a form titled "Create a New Announcement" with a close button "X". The first field is "Title\*" with a placeholder "Enter title". The second field is "Description\*" with a rich text editor toolbar and a placeholder "Enter description". At the bottom of the modal are two sections: "Project Tracking" with a date "Tue, Jan 21" and "Project Document Templates and Submissions Deadline" with a date "Thur, 16 Jan".

### 1.2.2.3 GRADEABLES

#### 1.2.2.3.1 QUIZ OVERVIEW

The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with various navigation options: Dashboard, Announcements, Gradeables (selected), Create Quiz, Quiz Statistics, Assignments, Form Management, People, Discussions, Calendar, Settings, and Log out. The main content area is titled "Quiz Overview". It displays three quizzes:

- Quiz 3: OOP using C++** (Average: 4.7/6, Dated: 05-02-2025, Number of Submissions: 248/250)
- Quiz 2: Software Processes** (Average: 4.2/6, Dated: 30-01-2025, Number of Submissions: 198/250)
- Quiz 1: Software Design** (Average: 4/6, Dated: 23-01-2025, Number of Submissions: 200/250)

A user profile for Indranil Saha is visible in the top right corner.

#### 1.2.2.3.2 Quiz Statistics/Details - Opens on clicking a particular quiz

The screenshot shows the SAHARA software interface. The sidebar is identical to the previous screenshot. The main content area is titled "Quiz Statistics" and is specifically for Quiz 3: OOP using C++ (Average: 4.7/6, Dated: 05-02-2025, Number of Submissions: 248/250). Below this, there is a question and code snippet:

Question 2. What will be the outcome when you attempt to compile and execute the following program

```
----
#include<iostream>
using namespace std;
class Box {
    int width;
public:
    void setWidth( double wid );
    friend void printWidth( Box box );
};
void Box::setWidth( double wid ) {
    width = wid;
}
void Box::printWidth( Box box ) {
    cout << "Width of box: " << box.width << endl;
}
int main() {
    Box box;
```

Below the code, it says "Correct Attempts: 200" and "Compilation Error (Correct Answer)" or "None of the above". At the bottom right, there is a "View Reports" button.

### 1.2.2.3.3 Quiz Report - Opens on clicking “View Reports”

The screenshot shows the SAHARA software interface. On the left, a dark blue sidebar menu lists various administrative functions: Dashboard, Announcements, Gradeables (selected), Create Quiz, Quiz Statistics, Assignments, Form Management, People, Discussions, and Calendar. Below these are Settings and Log out options. The main content area is titled "Quiz Statistics". It displays information for "Quiz 3: OOP using C+" dated 05-02-2025. The average score is 4.7/6, and there were 248 submissions. A search bar at the top allows for searching by name or roll number. Below the search bar is a table with columns: Roll Number, Student Name, and Marks Scored. The table contains four rows of data. To the right of the table is a bell curve graph titled "Marks Scored" showing the distribution of student marks. At the bottom of the page, there is a "Download as Excel File" button and some statistical summary values: Mean: 4.69/6, Mode: 5/6, Median: 5/6, and Standard Deviation: 0.89.

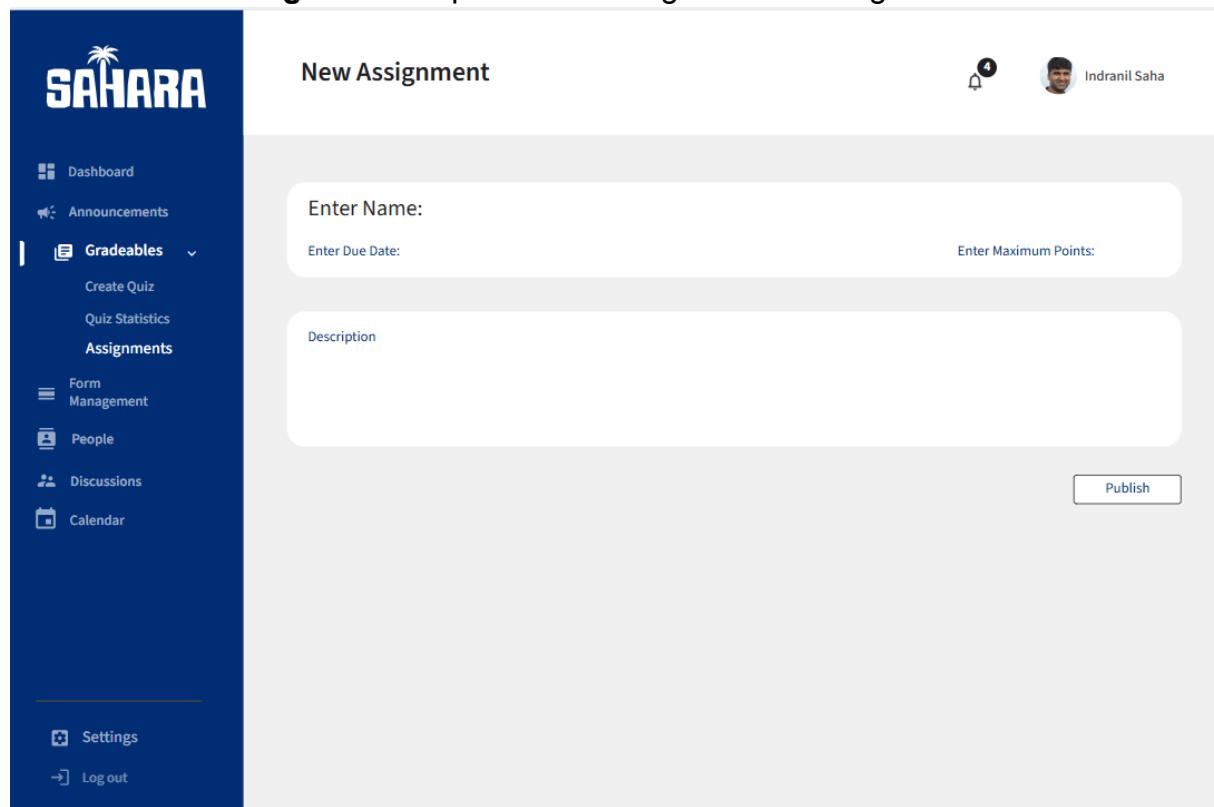
Roll Number	Student Name	Marks Scored
230001	Aarav Oswal	5/6
230024	Ashik Stenny	6/6
...	...	...
...	...	...

### 1.2.2.3.4 Assignment Overview - Opens on clicking “Assignments” under Gradeables

The screenshot shows the SAHARA software interface. The sidebar menu is identical to the previous screenshot, with Gradeables selected. The main content area is titled "Assignment Overview". It lists three assignments: Assignment 3, Assignment 2, and Assignment 1. Each assignment entry shows its due date and submission statistics. There is also an "Add Assignment" button at the bottom right. The assignment details are as follows:

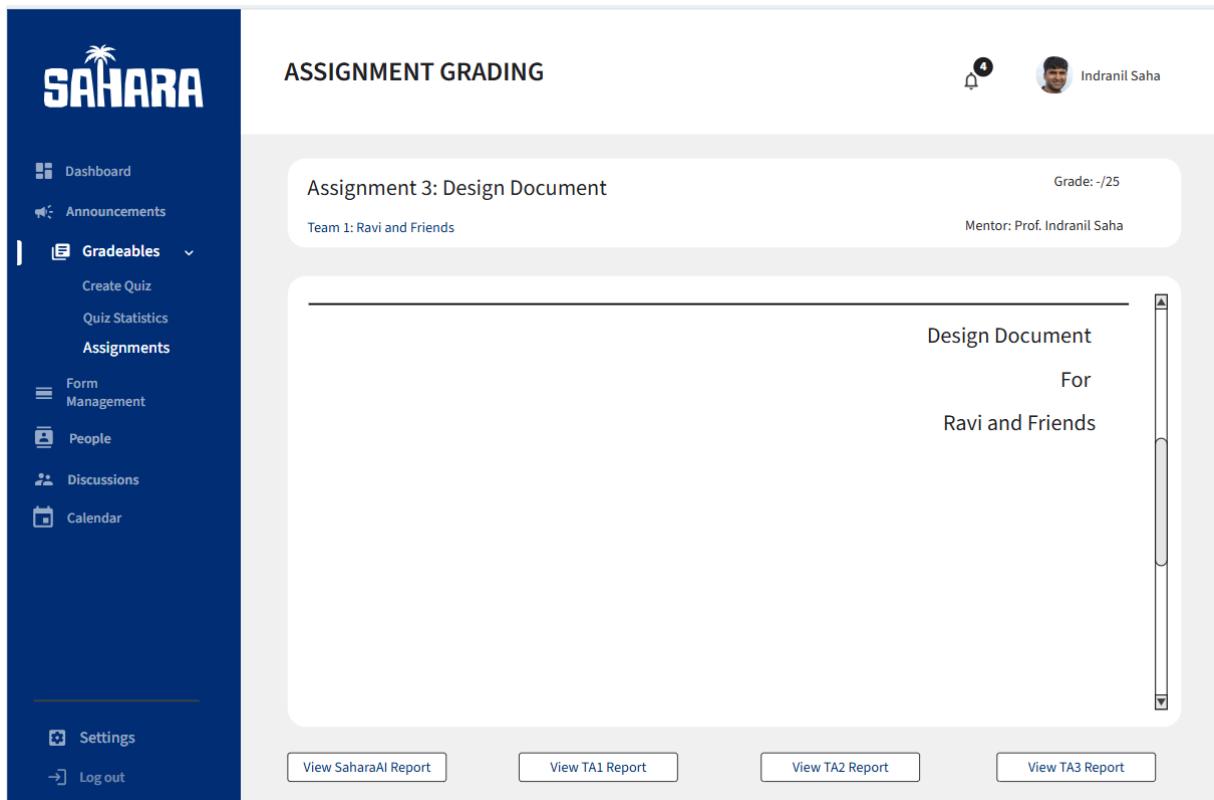
- Assignment 3**: Due: 05-02-2025. Graded Submissions: 0/248. Number of Submissions: 248/250.
- Assignment 2**: Due: 30-01-2025. Graded Submissions: 198/198. Number of Submissions: 198/250.
- Assignment 1**: Due: 23-01-2025. Graded Submissions: 200/200. Number of Submissions: 200/250.

### 1.2.2.3.5 New Assignment - Opens on clicking on “Add Assignment”



The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with various navigation options: Dashboard, Announcements, Gradeables (with sub-options Create Quiz, Quiz Statistics, Assignments), Form Management, People, Discussions, Calendar, Settings, and Log out. The main content area has a white header "New Assignment". In the top right corner, there is a user profile icon with a notification count of 1 and the name "Indranil Saha". Below the header, there are three input fields: "Enter Name:", "Enter Due Date:", and "Enter Maximum Points:". A large text area labeled "Description" is present. At the bottom right of the main area is a "Publish" button.

### 1.2.2.3.6 ASSIGNMENT GRADING



The screenshot shows the SAHARA software interface. The sidebar on the left is identical to the previous screenshot. The main content area has a white header "ASSIGNMENT GRADING". In the top right corner, there is a user profile icon with a notification count of 1 and the name "Indranil Saha". Below the header, there is a card for "Assignment 3: Design Document" with the grade "-/25" and the mentor "Mentor: Prof. Indranil Saha". The card also lists "Team 1: Ravi and Friends". Below the card is a large text area containing the assignment title "Design Document For Ravi and Friends". At the bottom of the main area are four buttons: "View SaharaAI Report", "View TA1 Report", "View TA2 Report", and "View TA3 Report".

The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with various navigation options: Dashboard, Announcements, Gradeables (selected), Create Quiz, Quiz Statistics, Assignments, Form Management, People, Discussions, and Calendar. Below these are Settings and Log out. The main content area has a header "ASSIGNMENT GRADING". In the top right corner, there is a notification icon with a '4' and a user profile for "Indranil Saha". The main content box is titled "Assignment 3: Design Document" and shows "Grade: -/25" and "Mentor: Prof. Indranil Saha". It contains a large text area with the title "Design Document For Ravi and Friends". At the bottom of this box are "View SaharaAI Report" and "Enter Grade:" buttons. Below this is a feedback section with a "Feedback:" label.

This screenshot is similar to the one above, showing the assignment grading page for Assignment 3: Design Document. The sidebar and header are identical. The main content box also has the same title and mentor information. However, at the bottom, there is additional information: "SaharaAI's Grade: 25/25" and a "SaharaAI Feedback:" section. This section includes a list of items with checkmarks and crossed-out items, such as "The document is well-structured and easy to follow." and "Consider adding a brief executive summary at the beginning.".

The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with various navigation options: Dashboard, Announcements, Gradeables (with 'Create Quiz' selected), Quiz Statistics, Assignments, Form Management, People, Discussions, Calendar, Settings, and Log out. The main content area is titled 'CREATE QUIZ'. At the top right, there is a notification icon with a '4' and a user profile for 'Indranil Saha'. Below the title, there are fields for 'Enter Name:' (with placeholder 'Quiz Name'), 'Enter Due Date:' (placeholder '2025-02-15'), and 'Enter Maximum Points:' (placeholder '100'). A dropdown menu shows 'Question Type: MCQ'. Under 'Question:', there is a checkbox for 'OPTION 1' and a link to 'Add Option'. At the bottom right are 'Save' and 'Publish' buttons. In the bottom right corner of the main area, there is a small '4' indicating pending notifications.

#### 1.2.2.4 FORM MANAGEMENT

The screenshot shows the SAHARA software interface. The sidebar is identical to the previous screenshot, with 'Form Management' selected under 'Gradeables'. The main content area is titled 'Forms Overview'. At the top right, there is a notification icon with a '4' and a user profile for 'Indranil Saha'. Below the title, there are three card-like sections: 'SRS Submission' (Released: 05-02-2025, Deadline: 12-02-2025, Number of Submissions: 248/250), 'Project Topic Selection' (Released: 30-01-2025, Deadline: 05-02-2025, Number of Submissions: 198/250), and 'TA Expertise Collection' (Released: 23-01-2025, Deadline: 30-01-2025, Number of Submissions: 200/250). The bottom right corner of the main area has a small '4' indicating pending notifications.

The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with navigation links: Dashboard, Announcements, Gradeables, Form Management (with Create Forms and View Forms), Teams, People, Discussions, Calendar, Settings, and Log out. The main area is titled 'Create Form'. It has fields for 'Enter Name:' and 'Enter Due Date:', a dropdown for 'Role: Student', and a section for 'Question:' with an 'Upload' button. Buttons for 'Add Question', 'Save', and 'Publish' are at the bottom. A user profile for 'Indranil Saha' is in the top right.

### 1.2.2.5 PEOPLE

The screenshot shows the SAHARA software interface. The sidebar is identical to the previous screenshot. The main area is titled 'PEOPLE'. It displays a table with columns: S. No., Name, email ID, and Role. The data is as follows:

S. No.	Name	email ID	Role
1	Aarav Oswal	aarav@iitk.ac.in	Student
2	Abhiram Jaiswal	abhiram@iitk.ac.in	TA
..	..	..	..
..	..	..	..
..	..	..	..
..	..	..	..
..	..	..	..
..	..	..	..
..	..	..	..

A user profile for 'Indranil Saha' is in the top right.

### 1.2.2.5.1 STUDENTS

The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with various navigation options: Dashboard, Announcements, Gradeables, Form Management, People (with sub-options Students, Teams, TA), Discussions, Calendar, Settings, and Log out. The main content area has a white header "STUDENTS". In the top right corner, there is a user profile icon with the name "Indranil Saha" and a notification bell icon with a red dot. Below the header is a sub-header "STUDENTS" in a rounded rectangle. The main content is a table with columns "S. No.", "Name", and "email". The table contains two rows of data:

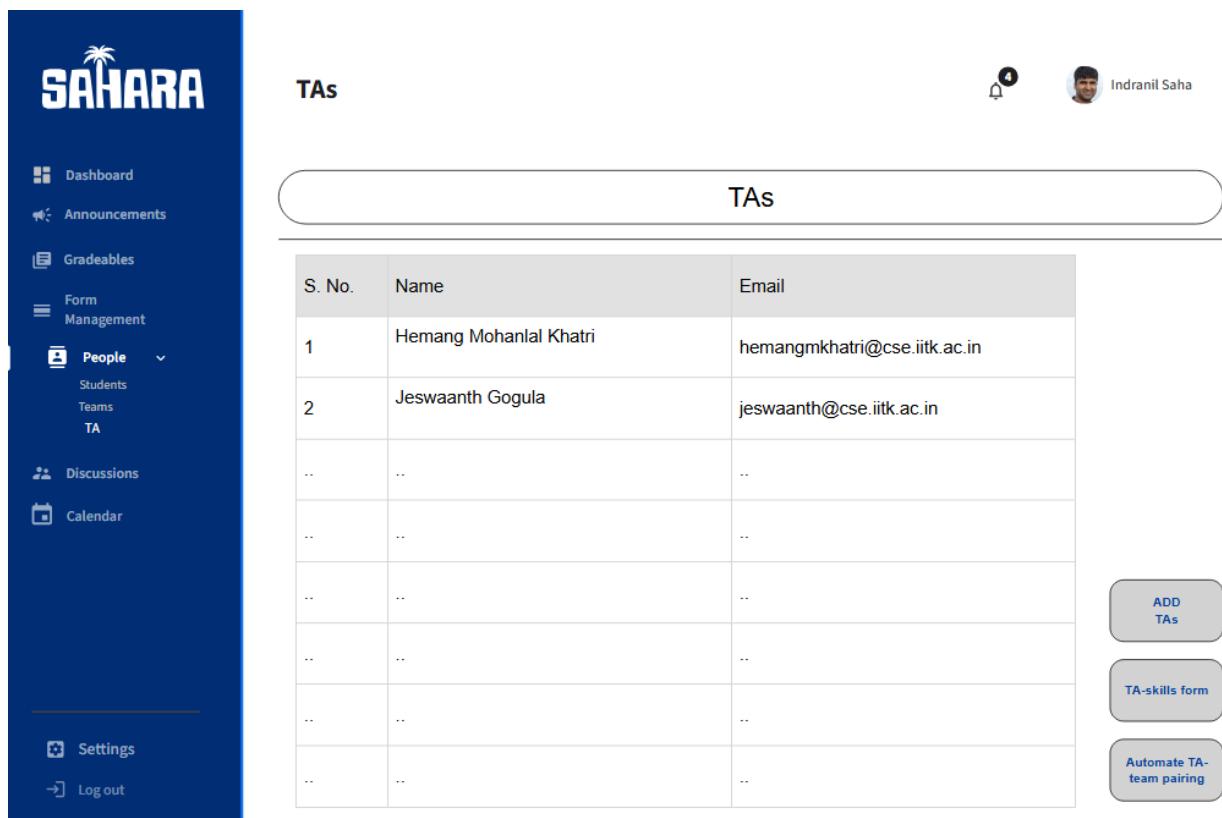
S. No.	Name	email
1	Aarav Oswal	aarav@iitk.ac.in
2	Achyuth Warrier	achyuth@iitk.ac.in
..	..	..
..	..	..
..	..	..
..	..	..
..	..	..
..	..	..

On the right side of the table is a blue button labeled "ADD STUDENTS".

#### 1.2.2.5.1.1 ADD STUDENTS

The screenshot shows the SAHARA software interface. The left sidebar is identical to the previous screenshot. The main content area has a white header "ADD STUDENTS". In the top right corner, there is a user profile icon with the name "Indranil Saha" and a notification bell icon with a red dot. Below the header is a sub-header "ADD STUDENTS" in a rounded rectangle. The main content is a form with a text input field labeled "Attach .csv file" and a small "clip" icon to its right.

### 1.2.2.5.2 TAs

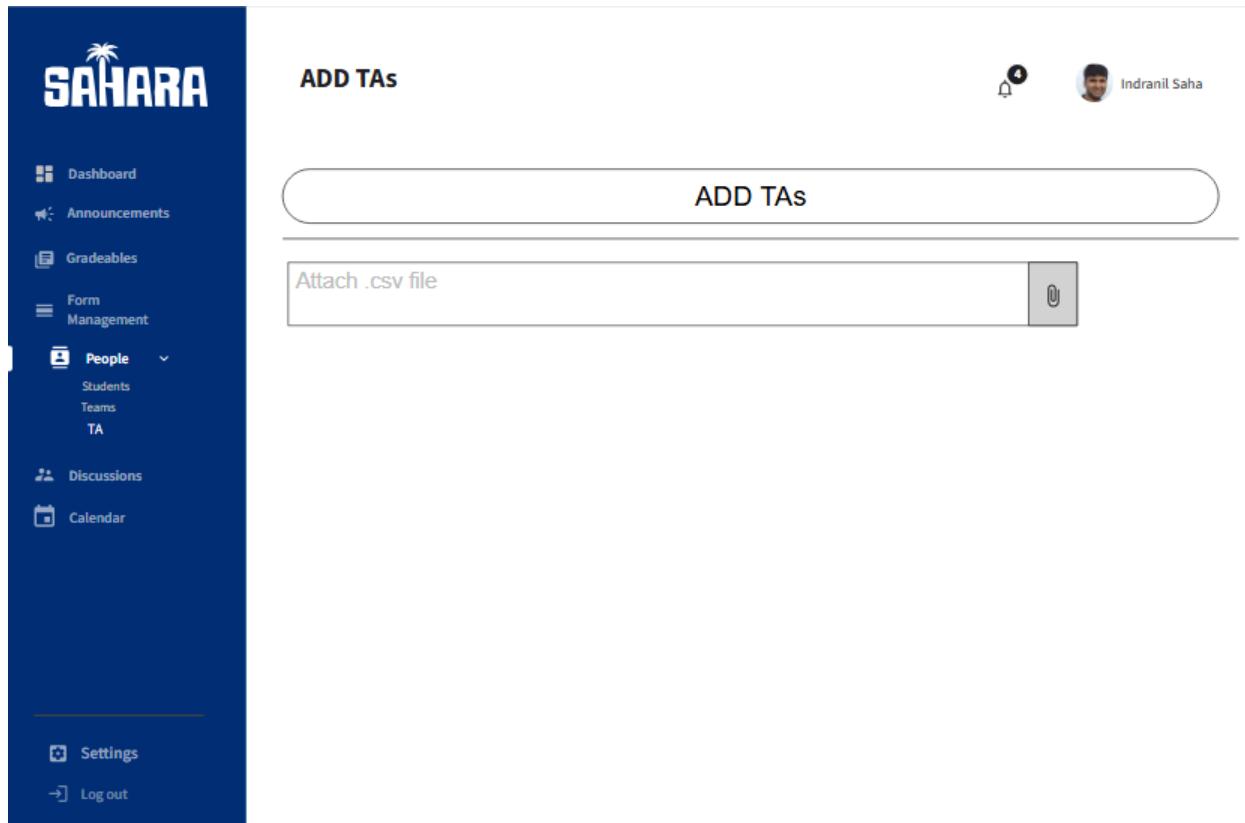


The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with the SAHARA logo at the top. Below the logo are several menu items: Dashboard, Announcements, Gradeables, Form Management, People (with sub-options: Students, Teams, TA), Discussions, Calendar, Settings, and Log out. The main content area has a white header with the text "TAs". In the top right corner, there is a user profile icon for "Indranil Saha". Below the header is a table titled "TAs" with three columns: "S. No.", "Name", and "Email". The table contains two rows of data:

S. No.	Name	Email
1	Hemang Mohanlal Khatri	hemangmkhatri@cse.iitk.ac.in
2	Jeswaanth Gogula	jeswaanth@cse.iitk.ac.in
..	..	..
..	..	..
..	..	..
..	..	..
..	..	..
..	..	..

To the right of the table are three rounded rectangular buttons: "ADD TAs", "TA-skills form", and "Automate TA-team pairing".

#### 1.2.2.5.2.1 ADD TAs



The screenshot shows the "ADD TAs" page of the SAHARA software. The layout is similar to the previous screenshot, with the dark blue sidebar on the left and the "ADD TAs" header in the main content area. The main content area features a large input field labeled "Attach .csv file" with a small "Browse" button to its right. The rest of the page is mostly blank, indicating where the uploaded CSV file would be processed.

### 1.2.2.5.2.2 TA SKILLS FORM

The screenshot shows the SAHARA software interface. On the left, there is a dark blue sidebar with the following navigation options:

- Dashboard
- Announcements
- Gradeables
- Form Management
- People
  - Students
  - Teams
  - TA
- Discussions
- Calendar

Below these are two buttons: "Settings" and "Log out".

The main content area has a header "TA SKILLS FORM" and a user profile for "Indranil Saha". Below the header is a title "TEACHING ASSISTANTS SKILLS FORM". There are two blue buttons at the top: "Add deadline" with a calendar icon and "Add text" with a text icon.

In the center is a large rectangular form area with three horizontal sections. The middle section contains the text "Drag and drop images required (currently empty)" and a small image icon.

At the bottom are two blue buttons: "Publish form" and "Finalize data and match teams with TA".

### 1.2.2.5.2.3 TA - TEAM PAIRING

The screenshot shows the SAHARA software interface. The sidebar is identical to the previous screenshot, featuring the same navigation options and user profile for "Indranil Saha".

The main content area has a header "TA - TEAM PAIRING" and a title "TA - TEAMS PAIRING OVERVIEW".

Below the title is a table with the following columns: S. No., Name, email ID, TA assigned, and TA email ID. The table contains several rows of data, with some entries showing placeholder values like "Ravi and Friends" and "bangaram@iitk.ac.in".

S. No.	Name	email ID	TA assigned	TA email ID
1	Ravi and Friends	bangaram@iitk.ac.in	Venkat Raghav	Venkatr@iitk.ac.in
2	Nechrozma	anant@iitk.ac.in	Shubham Gupta	Shubhamg@iitk.ac.in
..	..	..	..	..
..	..	..	..	..
..	..	..	..	..
..	..	..	..	..
..	..	..	..	..
..	..	..	..	..

At the bottom are two blue buttons: "Rematch TA's with teams" and "Finalize TA team pairing".

### TEAM CREATION FORM

Team Creation Status : Form Not Published

Enter Title:

Enter Deadline:

Description

[Publish](#)



Dashboard  
Announcements  
Gradeables  
Form Management  
**People** > Students > Teams > TA  
Discussions  
Calendar  
Settings  
Logout

Indranil Saha

### TEAMS' DETAILS

Team Creation Status : In Progress

Due : 05-02-2025      Teams Formed : 10/17

Team Number	Team Name	Member, Project Details
1	Ravi and Friends	...
2	Ravioli	...
...	...	...
...	...	...

Search Team

Formed Teams

Download as Excel File

Student Roll No	Student Name
231031	Spandan
231032	Sparsh
...	...
...	...

Search Name, Roll No

Students not in Teams

Allot unpaired students into existing teams

Finalize teams



Dashboard  
Announcements  
Gradeables  
Form Management  
**People** > Students > Teams > TA  
Discussions  
Calendar  
Settings  
Logout

Indranil Saha

**SAHARA**

- Dashboard
- Announcements
- Gradeables
- Form Management
- People
  - Students
  - Teams
  - TA
- Discussions
- Calendar

Settings Log out

## TEAMS' DETAILS

Team Creation Status : Complete

Due : 05-02-2025 Teams Formed : 17/17

Team Number	Team Name	Member, Project Details	Tech Stacks
1	Ravi and Friends	...	...
2	Ravioli	...	...
...	...	...	...
...	...	...	...

Search Team Formed Teams Create Beta-Test Pairs

Download as Excel File

**SAHARA**

- Dashboard
- Announcements
- Gradeables
- Form Management
- People
  - Students
  - Teams
  - TA
- Discussions
- Calendar

Settings Log out

## TEAMS' DETAILS

Team Creation Status : Complete

Due : 05-02-2025 Teams Formed : 17/17

Team Number	Team Name	Member, Project Details	Tech Stacks
1	Ravi and Friends	...	...
2	Ravioli	...	...
...	...	...	...
...	...	...	...

Search Team Formed Teams Search Name, Roll No Beta-Test Pairs

Team Number Pairs	Team Names	Common Tech Stacks
1-2	Ravi and Friends - Ravioli	...
...	...	...
...	...	...
...	...	...

Download as Excel File Download as Excel File

### 1.2.2.6 DISCUSSIONS

The image displays two screenshots of the SAHARA platform's discussion feature. Both screenshots show a sidebar on the left with a dark blue background containing the SAHARA logo at the top, followed by a list of navigation items: Dashboard, Announcements, Gradeables, Form Management, People, Discussions (which is highlighted in blue), and Calendar. Below these are Settings and Log out.

**Screenshot 1: #team8 + instructor**

This screenshot shows a discussion thread titled "Concurrency Management in Multi-Threaded Applications" posted on Jan 28. The thread contains three messages:

- The application was crashing ....
- We need to rewrite ....
- I will resolve it using ....

**Screenshot 2: #general**

This screenshot shows a discussion thread titled "Clarification Needed for Software Project implementation" posted on Jan 31. The thread contains three messages:

- Hello, we are facing some ....
- The structure was .....
- We are working .....

In both screenshots, the top right corner shows a user profile for "Indranil Saha" with a notification icon. The bottom right of each screenshot has a vertical scroll bar.

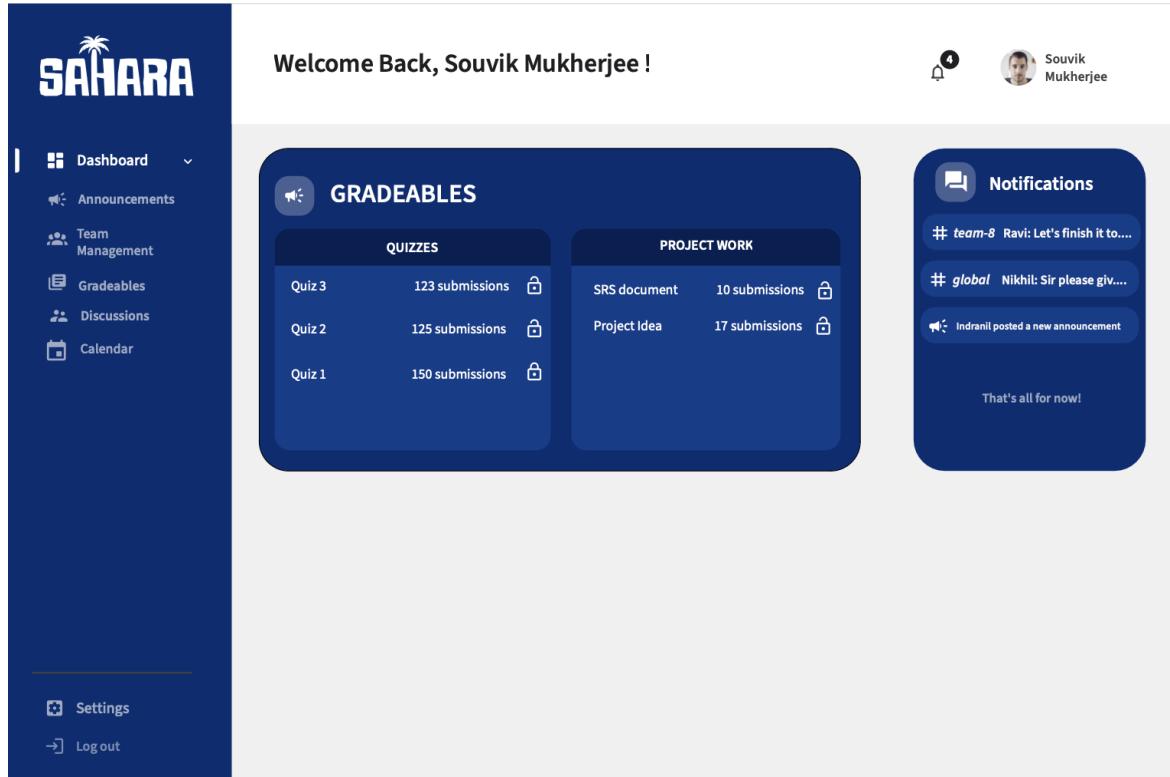
### 1.2.2.7 CALENDAR

The screenshot shows the SAHARA application's calendar page. The left sidebar has a dark blue background with white icons and text for Dashboard, Announcements, Gradeables, Form Management, People, Discussions, and Calendar. The Calendar item is currently selected and highlighted with a vertical dropdown menu. The main content area has a light gray background. At the top right, there is a notification icon with a small number '1' and a user profile picture for 'Indranil Saha'. Below this is a header 'CALENDAR' and a date 'January 23, 2025'. The calendar grid shows days from Sunday to Saturday. The 22nd is highlighted with a blue circle, indicating it is the current day. The 30th is also highlighted with a blue circle, and there are two smaller black circles next to it, likely representing the previous and next days in a week view.

### 1.2.3 TEACHING ASSISTANT

#### 1.2.3.1 DASHBOARD

The screenshot shows the SAHARA application's dashboard for the 'TEACHING ASSISTANT' role. The left sidebar has a dark blue background with white icons and text for Dashboard, Announcements, Gradeables, Form Management, People, Discussions, and Calendar. The Calendar item is currently selected and highlighted with a vertical dropdown menu. The main content area has a light gray background. At the top right, there is a notification icon with a small number '1' and a user profile picture for 'Indranil Saha'. Below this is a header 'EVENTS'. There are four blue rectangular cards with white text: '30 January 2025', 'DESIGN DOCUMENT DEADLINE', 'Post Quiz', and 'Post template of next doc'. Each card has a small circular arrow icon at the end of its description.



### 1.2.3.2 ANNOUNCEMENTS

The screenshot shows the SAHARA application's announcements section. The sidebar menu is identical to the previous dashboard. The main content area has a white header with the text "CS253: SOFTWARE DEVELOPMENT AND OPERATIONS". Below this is an "ANNOUNCEMENTS" card. It features a "Project Tracking" section by Indranil Saha (Tue, Jan 21) containing a message to students about a Google Sheet for project tracking. It lists two items for each team to add weekly. Below this is another section titled "Project Document Templates and Submissions Deadline" (Thur, 16 Jan).

**Project Tracking**

Tue, Jan 21

Dear Students,

I have created the following Google Sheet to track any difficulties the project teams are facing. <https://docs.google.com/spreadsheets/d/17NeJw8s0bjF6P0-sym2vA1X1pkQqvW9juhI99dkFaBQ/edit?usp=sharing>. There is one tab for each team. I request each team to add the following two pieces of information by **Friday Midnight** every week. There is one row for submitting the information for each week.

1. Date, Time and Venue for the Meeting with the TA,  
2. Pending Issues Requiring Instructor's Attention.

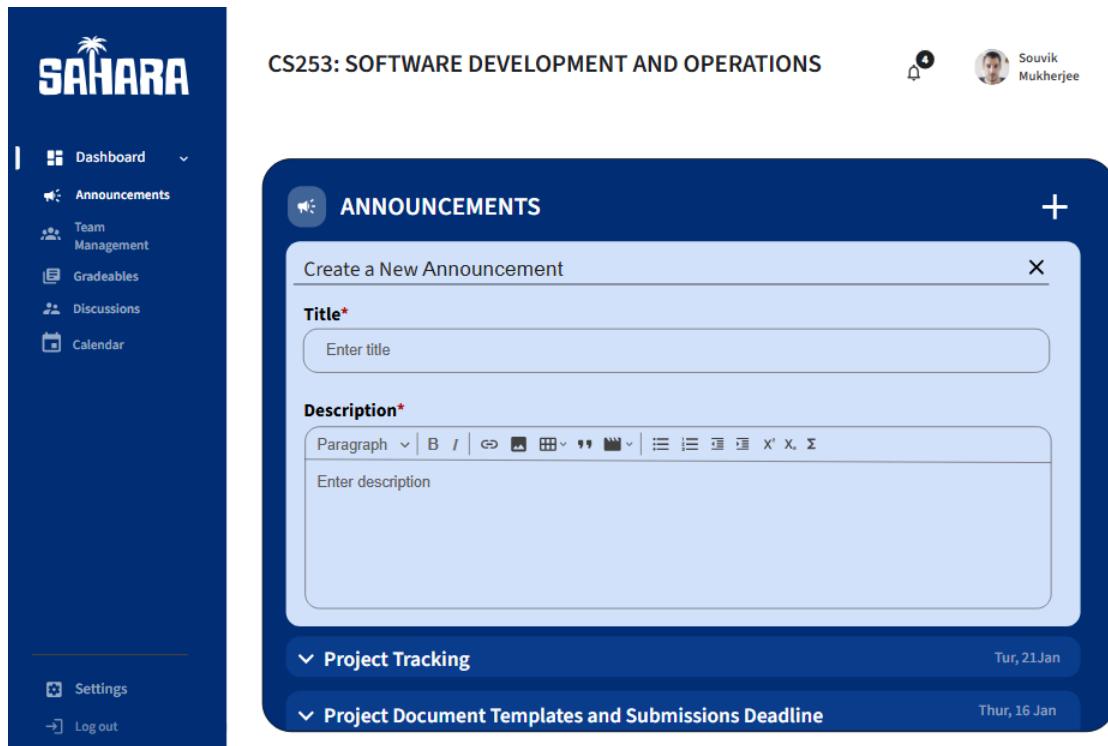
I will check this Google Sheet each Saturday. If there are any issues that were not resolved during the meeting with the TA, I will meet the team as soon as possible and try to address them. Please enter the data for the previous week by tomorrow (Tuesday) noon. I believe it would not take more than 10 minutes.

Best wishes,  
Indranil

**Project Document Templates and Submissions Deadline**

Thur, 16 Jan

### 1.2.3.3 CREATE ANNOUNCEMENTS



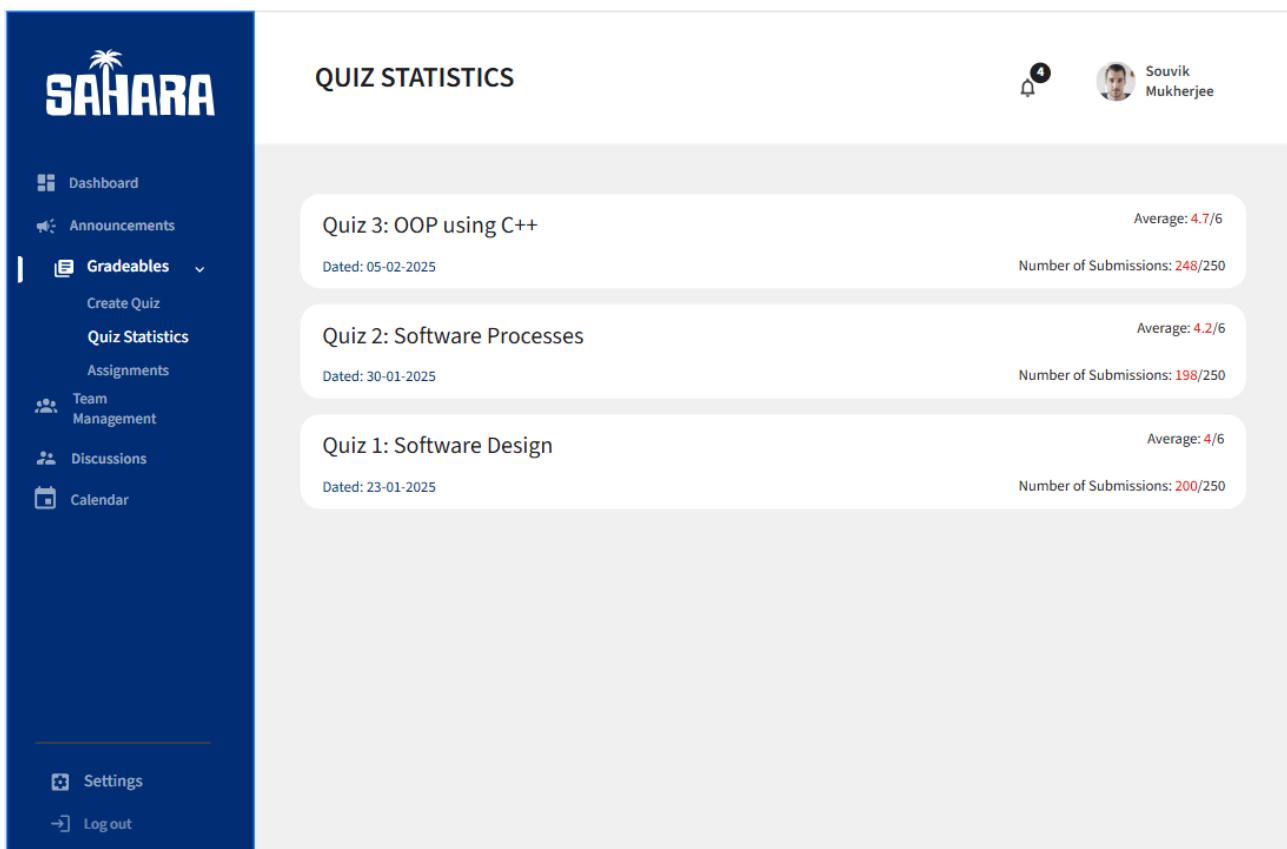
The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with the SAHARA logo at the top. Below it are several menu items: Dashboard, Announcements (which is currently selected), Team Management, Gradeables, Discussions, and Calendar. At the bottom of the sidebar are Settings and Log out links.

The main content area has a header "CS253: SOFTWARE DEVELOPMENT AND OPERATIONS". On the right, there is a user profile for "Souvik Mukherjee" with a notification badge of 4. Below the header is a large blue button labeled "+ ANNOUNCEMENTS".

The central part of the screen is a form titled "Create a New Announcement". It contains fields for "Title\*" (with placeholder "Enter title") and "Description\*" (with a rich text editor toolbar and placeholder "Enter description").

At the bottom of the form, there are two sections: "Project Tracking" (with a due date of "Tue, 21 Jan") and "Project Document Templates and Submissions Deadline" (with a due date of "Thur, 16 Jan").

### 1.2.3.4 GRADABLES

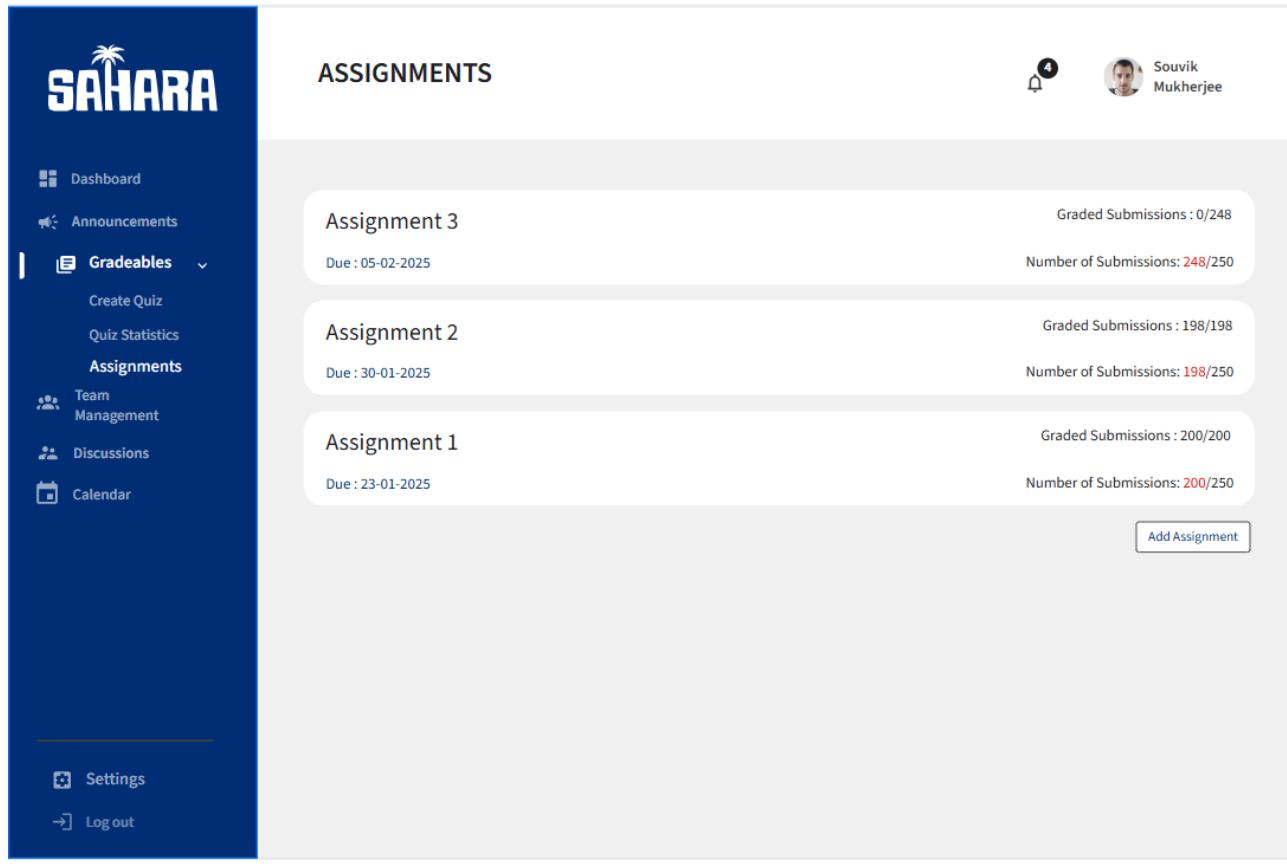


The screenshot shows the SAHARA software interface. The sidebar on the left is identical to the previous screenshot, featuring the SAHARA logo, a sidebar menu with "Gradeables" selected, and bottom links for Settings and Log out.

The main content area has a header "QUIZ STATISTICS". On the right, there is a user profile for "Souvik Mukherjee" with a notification badge of 4.

The page displays three quiz statistics cards:

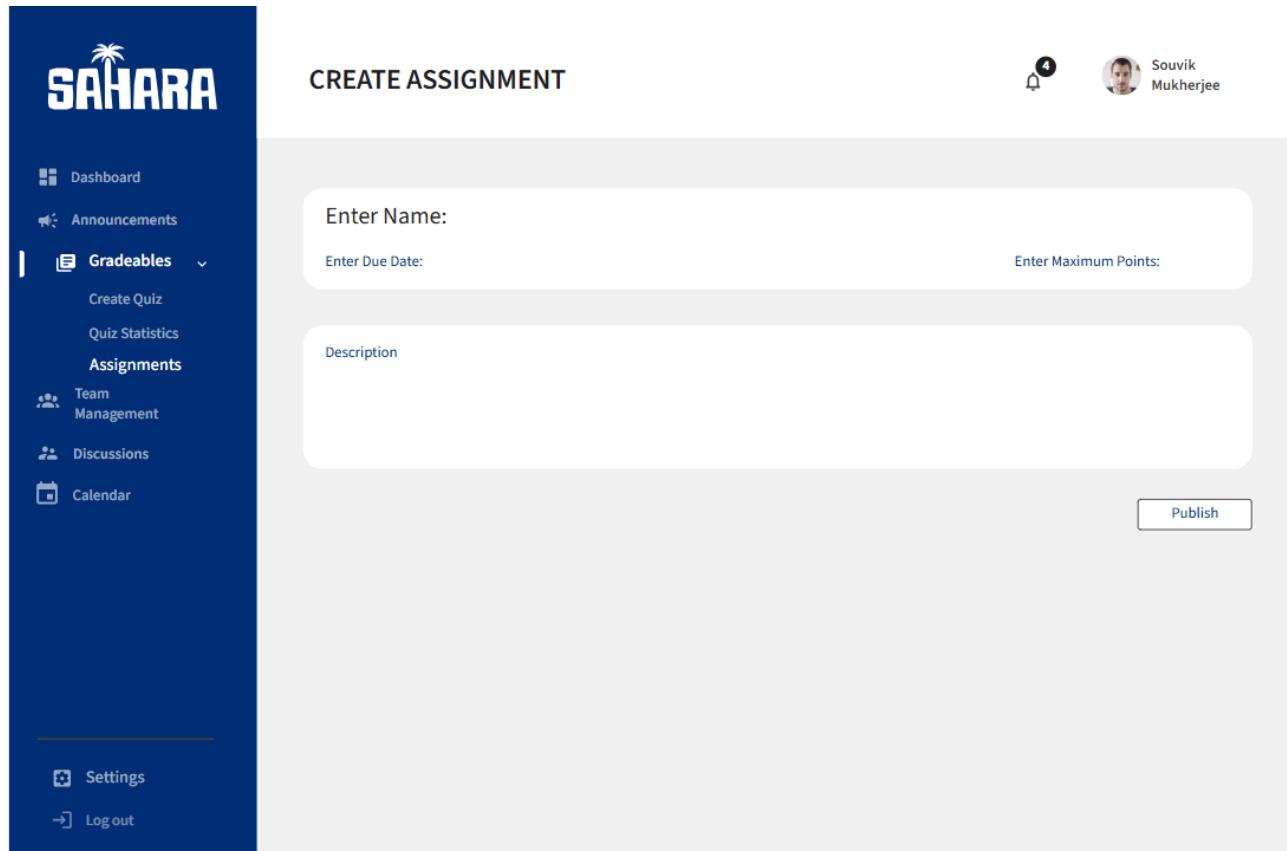
- Quiz 3: OOP using C++** (Average: 4.7/6) - Dated: 05-02-2025. Number of Submissions: 248/250.
- Quiz 2: Software Processes** (Average: 4.2/6) - Dated: 30-01-2025. Number of Submissions: 198/250.
- Quiz 1: Software Design** (Average: 4/6) - Dated: 23-01-2025. Number of Submissions: 200/250.



The screenshot shows the 'ASSIGNMENTS' section of the SAHARA application. On the left, a sidebar menu includes 'Dashboard', 'Announcements', 'Gradeables' (selected), 'Create Quiz', 'Quiz Statistics', 'Assignments' (selected), 'Team Management', 'Discussions', and 'Calendar'. Below the sidebar are 'Settings' and 'Log out' links. The main content area displays three assignments:

- Assignment 3**: Due: 05-02-2025. Graded Submissions: 0/248. Number of Submissions: 248/250.
- Assignment 2**: Due: 30-01-2025. Graded Submissions: 198/198. Number of Submissions: 198/250.
- Assignment 1**: Due: 23-01-2025. Graded Submissions: 200/200. Number of Submissions: 200/250.

A 'Add Assignment' button is located at the bottom right of the assignment list.



The screenshot shows the 'CREATE ASSIGNMENT' page. The left sidebar is identical to the one in the previous screenshot. The main content area has a 'Enter Name:' input field, an 'Enter Due Date:' input field, an 'Enter Maximum Points:' input field, and a 'Description' text area. A 'Publish' button is located at the bottom right of the form.

The screenshot shows the 'Assignment Statistics' page for 'Assignment 3: Design Document'. The page includes a header with the title, a due date of '05-02-2025', and submission statistics: 'Graded Submissions: 5/248' and 'Number of Submissions: 248/250'. A user profile for 'Souvik Mukherjee' is visible. Below this, a table lists team submissions with columns for Team Number, Team Name, Submission file, Marks Awarded, and Edit Marks link. A download button for an Excel file is present, along with summary statistics: Mean: 19.5/25, Mode: 21/25, Median: 20/25, and Standard Deviation: 0.89.

Team Number	Team Name	Submission	Marks Awarded
1	Ravi and Friends	<a href="#">sub.pdf</a>	Not graded
2	Ravioli	<a href="#">sub2.pdf</a>	20/25
...	...	...	...
...	...	...	...

The screenshot shows the 'CREATE QUIZ' page. It features fields for 'Enter Name:', 'Enter Due Date:', and 'Enter Maximum Points:'. A dropdown menu shows 'Question Type: MCQ'. Below these, a 'Question:' section contains a checkbox for 'OPTION 1' and a link to 'Add Option'. At the bottom are 'Add Question', 'Save', and 'Publish' buttons.

# SAHARA

**Dashboard**

**Announcements**

**Gradeables** ▼

- Create Quiz
- Quiz Statistics**
- Assignments

**Team Management**

**Discussions**

**Calendar**

---

**Settings**

**Log out**

## QUIZ STATISTICS

Quiz 3: OOP using C++ Average: 4.7/6

Dated: 05-02-2025 Number of Submissions: 248/250

Q1 Q2 Q3 Q4 Q5

Question 2. What will be the outcome when you attempt to compile and execute the following program  
....  

```
#include<iostream>
using namespace std;
class Box {
    int width;
public:
    void setWidth( double wid );
    friend void printWidth( Box box );
};
void Box::setWidth( double wid ) {
    width = wid;
}
void Box::printWidth( Box box ) {
    cout << "Width of box: " << box.width << endl;
}
int main() {
    Box box;
```

Correct Attempts: 200 Total Attempts: 248

Compilation Error (Correct Answer)  
None of the above

**View Reports**

# SAHARA

**Dashboard**

**Announcements**

**Gradeables** ▼

- Create Quiz
- Quiz Statistics**
- Assignments

**Team Management**

**Discussions**

**Calendar**

---

**Settings**

**Log out**

## QUIZ STATISTICS

Quiz 3: OOP using C++ Average: 4.7/6

Dated: 05-02-2025 Number of Submissions: 248/250

Search Name, Roll No

Roll Number	Student Name	Marks Scored
230001	Aarav Oswal	5/6
230024	Ashik Stenny	6/6
...	...	...
...	...	...

**Download as Excel File**

Mean: 4.69/ 6 Mode : 5/6 Median : 5/6 Standard Deviation: 0.89

Marks Scored

No. of Students

Marks out of 6

The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with the SAHARA logo at the top. Below the logo are several menu items: Dashboard, Announcements, Gradeables (with sub-options Create Quiz, Quiz Statistics, Assignments), Team Management, Discussions, and Calendar. At the bottom of the sidebar are Settings and Log out buttons.

The main content area is titled "ASSIGNMENT GRADING". At the top right, there is a user profile for "Souvik Mukherjee" with a grade of 4/25. Below the title, a box displays "Assignment 3: Design Document" for "Team 1: Ravi and Friends" with a mentor "Prof. Indranil Saha". A large document preview window shows the title "Design Document For Ravi and Friends". At the bottom of this window are four buttons: "View SaharaAI Report", "View TA1 Report", "View TA2 Report", and "View TA3 Report".

This screenshot is identical to the one above, showing the SAHARA assignment grading page. However, it includes a new "Feedback:" input field at the bottom of the main content area, below the "View SaharaAI Report" button. To the right of this input field is a placeholder "Enter Grade:".

The screenshot shows the 'Assignment Grading' section of the SAHARA platform. On the left sidebar, under 'Gradeables', 'Assignments' is selected. The main area displays an assignment titled 'Assignment 3: Design Document' for 'Team 1: Ravi and Friends'. The mentor is listed as 'Prof. Indranil Saha'. The document title is 'Design Document For Ravi and Friends'. A vertical scroll bar is visible on the right. Below the document, it says 'SaharaAI's Grade: 25/25'. The feedback section lists three points: 1. Clarity & Organization (10/10) with a note about well-structure and executive summary. 2. Completeness (10/10) with a note about requirements, architecture, API, security, and testing strategy. 3. Technical Feasibility (10/10) with a note about missing unit and integration testing details.

### 1.2.3.5 DISCUSSIONS

#### 1.2.3.5.1 DISCUSSIONS - STUDENT GENERAL

The screenshot shows the 'DISCUSSIONS' section of the SAHARA platform. On the left sidebar, 'Discussions' is selected. The main area shows a general discussion thread. The title of the thread is 'Clarification Needed for Software Project Implementation'. A message from a student on Jan 31 says, 'Hello, we are facing some ....'. An instructor responds with, 'The structure was .....'. Another student replies with, 'We are working .....'. A text input field at the bottom says 'Type something here ....'.

#### 1.2.3.5.2

#### DISCUSSION - STUDENT - TEAM + INSTRUCTOR

The screenshot shows the SAHARA platform's discussion interface. On the left is a dark sidebar with navigation links: Dashboard, Announcements, Project, Team Management, Gradeables, Discussions (which is selected), Calendar, Settings, and Log out. The main area has a header 'DISCUSSIONS' and a user profile for 'Ravi Arora'. Below this is a search bar and a 'Start new conversation' button. A specific discussion thread is shown with a title 'Clarification Needed for Software Project Implementation'. The messages in the thread are:

- Jan 31: Hello, we are facing some ....
- The structure was .....
- We are working .....

A text input field at the bottom says 'Type something here ....'

### 1.2.3.5.3 DISCUSSIONS - STUDENT - TEAM

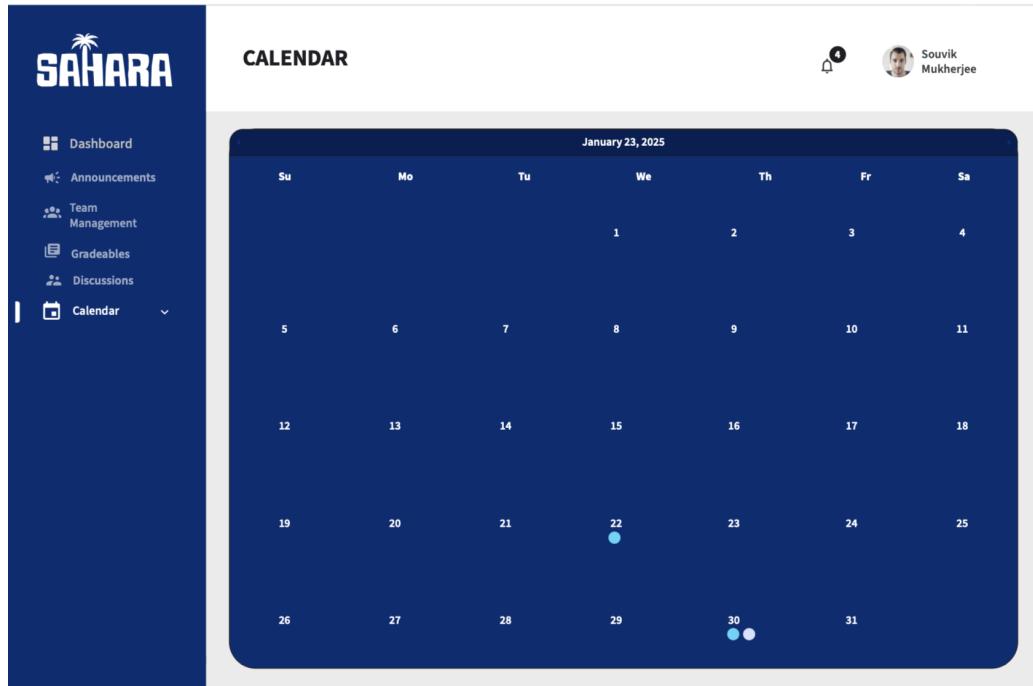
This screenshot shows another discussion thread on the SAHARA platform. The sidebar and header are identical to the previous one. The discussion title is 'Optimizing Data Structures for High-Performance Computing'. The messages in this thread are:

- Jan 30: Did you guys ...
- No , we are still implementing .....
- We will finish it tonight.

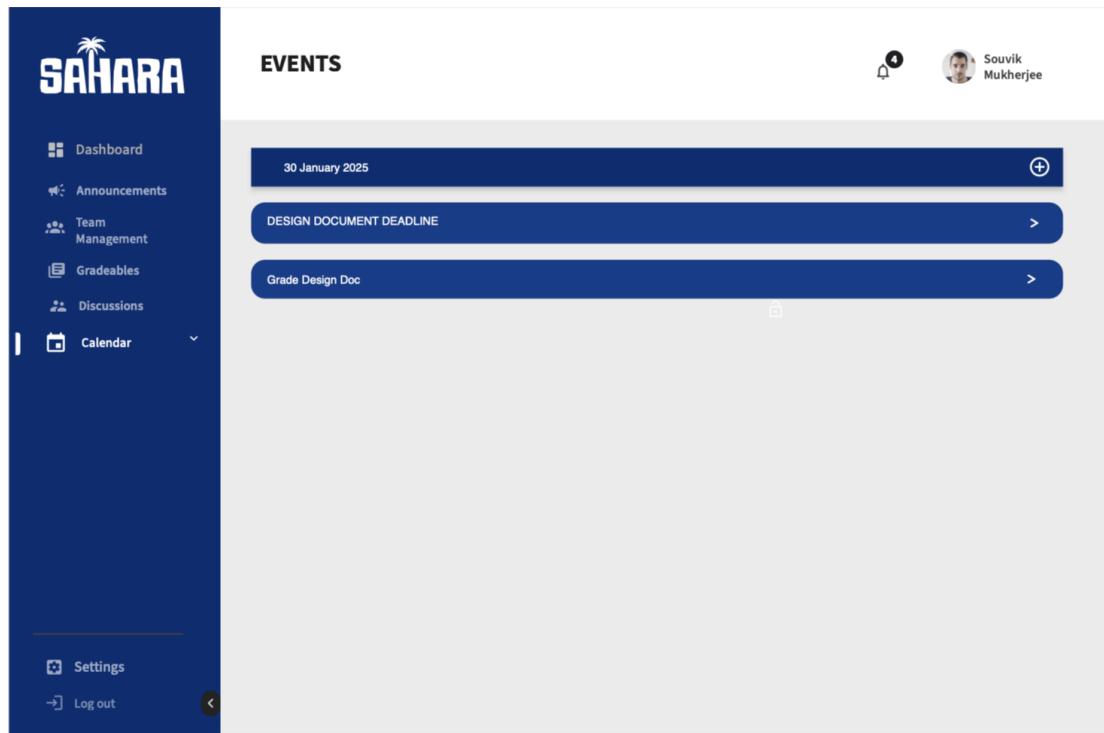
The bottom input field again says 'Type something here ....'.

### 1.2.3.6 CALENDAR

#### 1.2.3.6.1 CALENDAR - GENERAL CALENDAR



### 1.2.3.6.2 CALENDAR - EVENTS



## 1.2.4 STUDENT

### 1.2.4.1 DASHBOARD

Welcome Back, Ravi Arora !

**Upcoming Deadlines**

Requirement Doc..	24 Jan
Quiz 3	25 Jan
Quiz 4	27 Jan
Design Document	7 Feb

**Recent Announcements**

- Project Tracking (Tue, Jan 21)
- Project Document Templates... (Thur, Jan 16)
- Project Mentor (Thur, Jan 16)
- Project Registration (Fri, Jan 10)

**Notifications**

- # team-8 Ravi: Let's finish it to....
- # global Nikhil: Sir please giv....
- Indranil posted a new announcement

That's all for now!

### 1.2.4.2 ANNOUNCEMENTS

ANNOUNCEMENTS

**Project Tracking** (Tue, Jan 21)

Dear Students,

I have created the following Google Sheet to track any difficulties the project teams are facing. <https://docs.google.com/spreadsheets/d/17NeJw8s0bjF6P0-sym2vA1X1pKQvW9juh9dlkFaBQ/edit?usp=sharing>. There is one tab for each team. I request each team to add the following two pieces of information by Friday Midnight every week. There is one row for submitting the information for each week.

1. Date, Time and Venue for the Meeting with the TA,  
2. Pending Issues Requiring Instructor's Attention.

I will check this Google Sheet each Saturday. If there are any issues that were not resolved during the meeting with the TA, I will meet the team as soon as possible and try to address them. Please enter the data for the previous week by tomorrow (Tuesday) noon. I believe it would not take more than 10 minutes.

Best wishes,  
Indranil

**Project Document Templates and Submissions Deadline** (Thur, 16 Jan)

### 1.2.4.3 PROJECT

#### 1.2.4.3.1 PROJECT - DOCUMENTATION

The screenshot shows the SAHARA project management platform. On the left, a dark sidebar menu includes options like Dashboard, Announcements, Project Documentation (selected), Github, Quizzes, Discussions, Calendar, and Forms. At the bottom of the sidebar are Settings and Logout links. The main content area is titled "PROJECT" and "DOCUMENTATION". It displays a document titled "Software\_Requirement\_Document\_Ravi\_And\_Friends.docx" which is described as an "LLM - GENERATED REPORT". The report content is a Software Requirements Specification (SRS) document. It starts with an introduction, purpose, scope, and definitions. It also includes sections for references and overall description. At the bottom of the report, there are "Submit document" and "Check Score" buttons.

#### 1.2.4.3.2 PROJECT - GITHUB

The screenshot shows the SAHARA project management platform. The sidebar menu is identical to the previous documentation screenshot. The main content area is titled "PROJECT" and "GITHUB". It displays a GitHub link: "https://github.com/ravi-arora/project-repo". At the bottom of the GitHub section is an "Add link" button.

## 1.2.4.4 QUIZZES

### 1.2.4.4.1 VIEW QUIZ

The screenshot shows the SAHARA application's interface. On the left is a dark blue sidebar with the SAHARA logo at the top. Below the logo are several navigation items: Dashboard, Announcements, Project, Quizzes (which is currently selected and highlighted in blue), Discussions, Calendar, and Forms. At the bottom of the sidebar are Settings and Log out options. The main content area has a light gray header with the word "QUIZZES". In the top right corner of the header is a user profile icon for "Ravi Arora" and a notification bell icon with a red dot. Below the header, there are three cards representing different quizzes:

- Quiz 3: OOP using C++**: Score: /6, Deadline: 05-02-2025, Attempt button.
- Quiz 2: Software Processes**: Score: 6/6, Deadline: 30-01-2025.
- Quiz 1: Software Design**: Score: 4/6, Deadline: 23-01-2025.

Below the cards, there are two rows of dates with small arrows between them, indicating a timeline or sequence of events:

- Tue, Jan 23 → Thur, Jan 19
- Thur, Jan 19 → Thur, Jan 16
- Fri, Jan 10 → Thur, 16 Jan

### 1.2.4.4.2 ATTEMPT QUIZ

The screenshot shows the SAHARA application's interface. The left sidebar is identical to the previous screenshot, featuring the SAHARA logo and various navigation links. The main content area has a light gray header with the word "QUIZ". In the top right corner of the header is a user profile icon for "Ravi Arora" and a notification bell icon with a red dot. Below the header, there is a large rectangular box labeled "ATTEMPT QUIZ". Inside this box, the following information is displayed:

**Quiz 3: OOP using C++**  
Dated: 05-02-2025

Question 2. What will be the outcome when you attempt to compile and execute the following program  
....

```
#include<iostream>
using namespace std;
class Box {
    int width;
public:
    void setWidth( double wid );
    friend void printWidth( Box box );
};
void Box::setWidth( double wid ) {
    width = wid;
}
void Box::printWidth( Box box ) {
```

Compilation Error (Correct Answer)  
None of the above

At the bottom of the page is a large blue button labeled "Submit quiz".

### 1.2.4.5 DISCUSSIONS

The screenshot shows the SAHARA platform's discussion interface. On the left is a dark blue sidebar with the SAHARA logo at the top. Below it are links for Dashboard, Announcements, Project, Quizzes, Discussions (which is highlighted), Calendar, and Forms. At the bottom of the sidebar are links for Settings and Log out. The main area has a header "DISCUSSIONS" and a user profile for "Ravi Arora". Below the header, the path "Discussions > #team8" is shown. A search bar and a "Start new conversation" button are available. The main content area displays a message thread for a topic titled "Optimizing Data Structures for High-Performance Computing" posted on Jan 30. The messages are:

- Did you guys ... (User 1)
- No , we are still implementing ..... (User 2)
- We will finish it tonight. (User 1)

A text input field at the bottom says "Type something here ....".

The screenshot shows the SAHARA platform's discussion interface. The sidebar and header are identical to the previous screenshot. The main area shows a discussion thread for the "#general" channel. The path "Discussions > #general" is shown. The main content area displays a message thread for a topic titled "Clarification Needed for Software Project Implementation" posted on Jan 31. The messages are:

- Hello, we are facing some .... (User 1)
- The structure was ..... (User 2)
- We are working ..... (User 1)

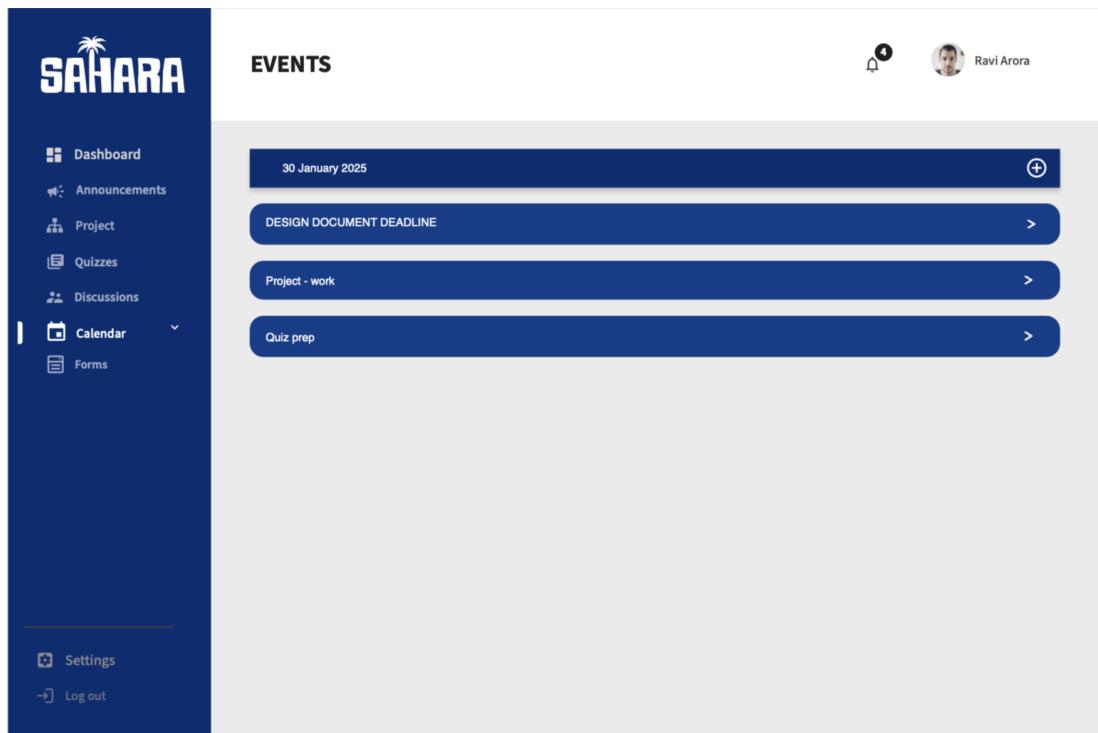
A text input field at the bottom says "Type something here ....".

The screenshot shows the 'DISCUSSIONS' section of the SAHARA platform. The left sidebar includes links for Announcements, Project, Quizzes, Discussions (selected), Calendar, and Forms. The main area shows a search bar and a 'Start new conversation' button. A specific thread titled 'Concurrency Management in Multi-Threaded Applications' is displayed, dated Jan 28. It contains three messages: 'The application was crashing ....', 'We need to rewrite ....', and 'I will resolve it using ....'. A text input field at the bottom says 'Type something here ....'.

#### 1.2.4.5 CALENDAR

The screenshot shows the 'CALENDAR' section of the SAHARA platform. The left sidebar includes links for Dashboard, Announcements, Project, Quizzes, Discussions, Calendar (selected), and Forms. The main area displays a calendar for January 2025, with the 22nd highlighted in blue. The days of the week are labeled Su, Mo, Tu, We, Th, Fr, Sa.

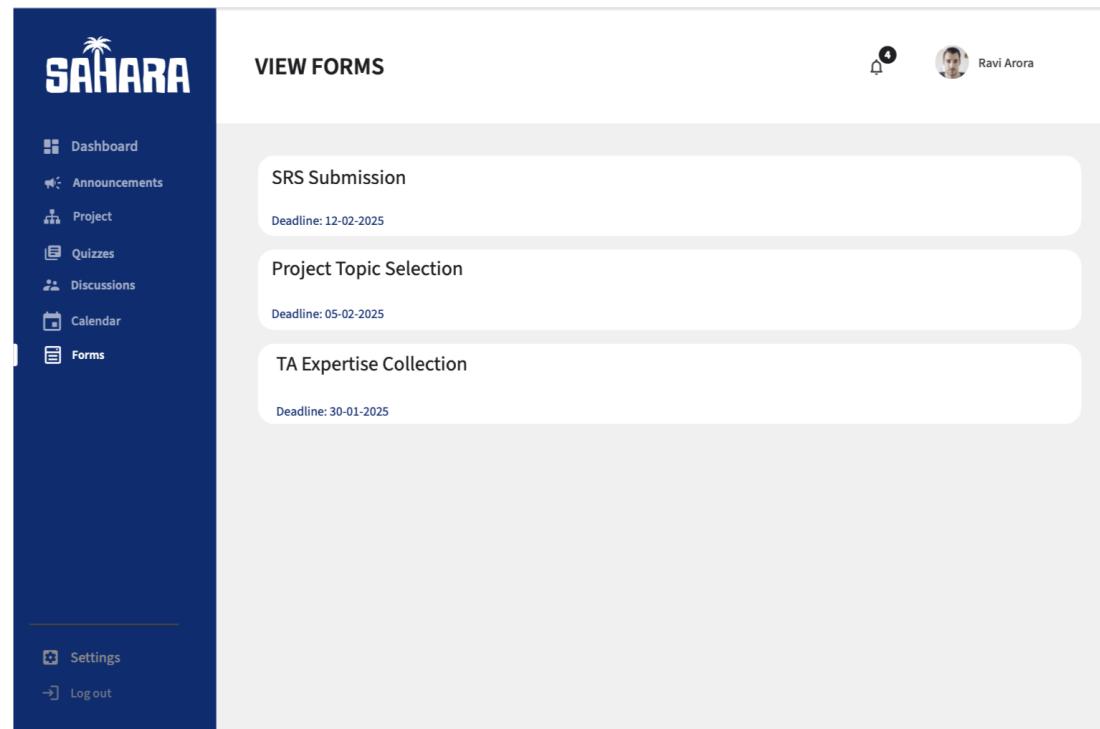
January 23, 2025						
Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	



The screenshot shows the 'Events' section of the SAHARA software. On the left is a dark blue sidebar with the 'SAHARA' logo at the top. Below it are navigation links: Dashboard, Announcements, Project, Quizzes, Discussions, Calendar (selected), and Forms. At the bottom are Settings and Log out links. The main content area has a light gray header with the word 'EVENTS'. In the top right corner, there is a user profile for 'Ravi Arora' with a notification icon showing '1'. Below the header, there is a list of events:

- 30 January 2025 (with a plus sign icon)
- DESIGN DOCUMENT DEADLINE (with a right arrow icon)
- Project - work (with a right arrow icon)
- Quiz prep (with a right arrow icon)

#### 1.2.4.6 FORMS



The screenshot shows the 'View Forms' section of the SAHARA software. The layout is identical to the previous 'Events' page, with the same dark blue sidebar and navigation links. The main content area has a light gray header with the word 'VIEW FORMS'. In the top right corner, there is a user profile for 'Ravi Arora' with a notification icon showing '1'. Below the header, there is a list of forms:

- SRS Submission (Deadline: 12-02-2025)
- Project Topic Selection (Deadline: 05-02-2025)
- TA Expertise Collection (Deadline: 30-01-2025)

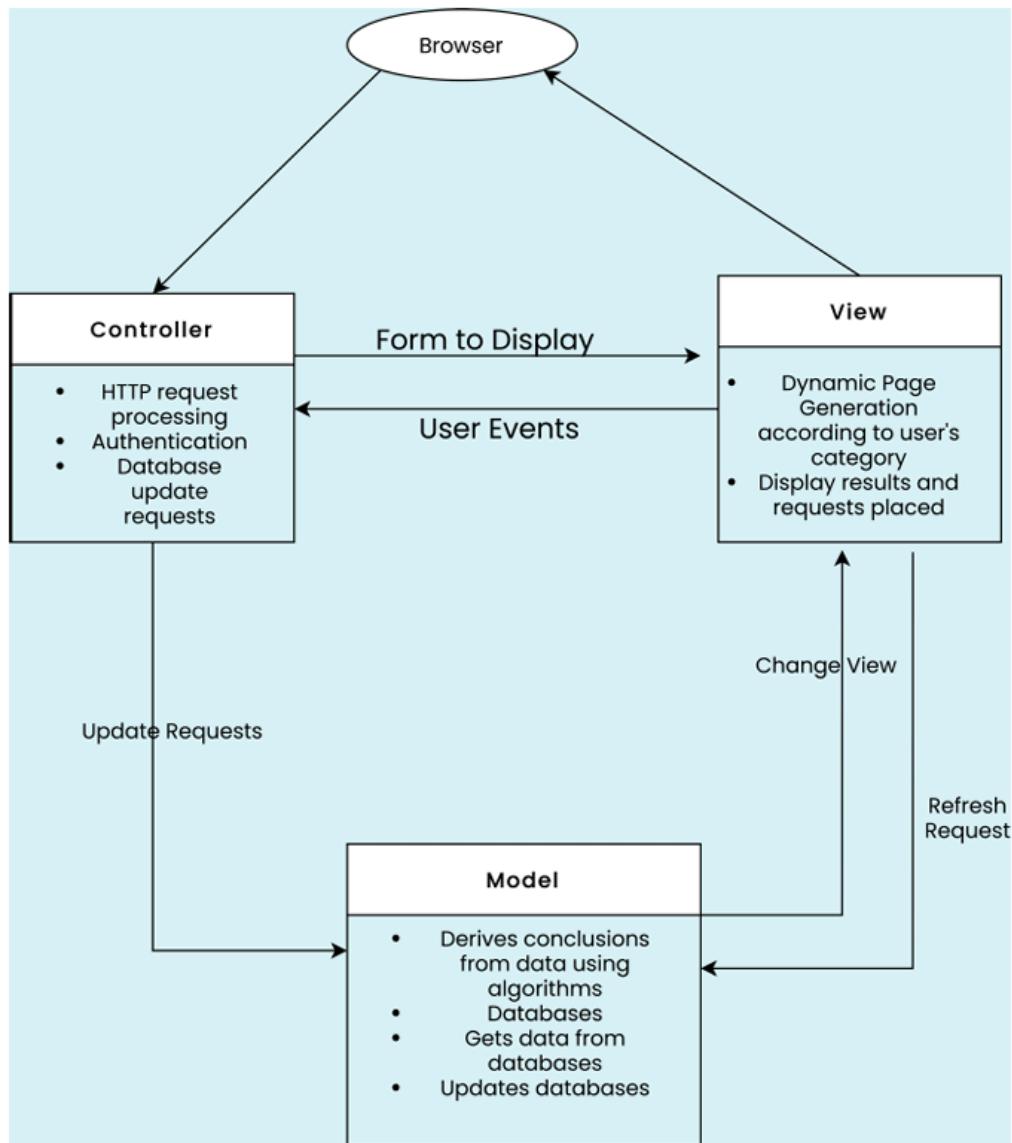
The screenshot shows the SAHARA software interface. On the left is a dark blue sidebar with the SAHARA logo at the top. Below the logo are several menu items: Dashboard, Announcements, Project, Quizzes, Discussions, Calendar, and Forms. At the bottom of the sidebar are Settings and Log out options. The main content area has a light gray header bar with the text "FILL FORM" on the left and a user profile icon with the name "Ravi Arora" on the right. Below this is a white form titled "Project Topic Selection". Inside the form, there is a note "Deadline: 12-02-2025". The form contains three input fields: "Team Name:", "Project Name:", and "Project Description:". In the bottom right corner of the form area is a "Submit" button.

## 2 Architecture Design

### 2.1 Overview

The application intends to be a web-application, intended for use in modern browsers, offering a clean frontend to be intended for use in the browser, connecting to the backend, powered by servers, to allow for centralized control and processing of data.

At a broad overview, the application's architecture is intended to follow the **Model-View-Controller** architecture. The reason for this is this allows for clear separation and decoupling of parts of the application, allowing for parallel development between various segments of code since they can be worked on individually while ensuring usability for the others, better code organization, scalability and maintainability, etc.



**Model:**

The model is a powerful backend based on Node.js and Python frameworks, integrating SQL-based and NoSQL databases, which establish an efficient system for storing relevant data allowing for smooth implementation of various features, such as storing data for course structure and user information, team data, forums, handling submitted documents, etc. and will expose various APIs to allow for retrieval and updation of data.

**Controller:**

The Controller is responsible to handle user events and certain time triggered events, correspondingly sending requests to the model and returning the responses to the view. It ensures consistency in data between the view and model, providing a bridging interface for both. It would also implement crucial security features, like authentication, Role-Based Access Control, etc., as well as features such as pushing notifications to users based on changes in the model data.

**View:**

Different views are employed on the basis of the roles of users and the functionality the user wishes to access. These are broadly classified as:

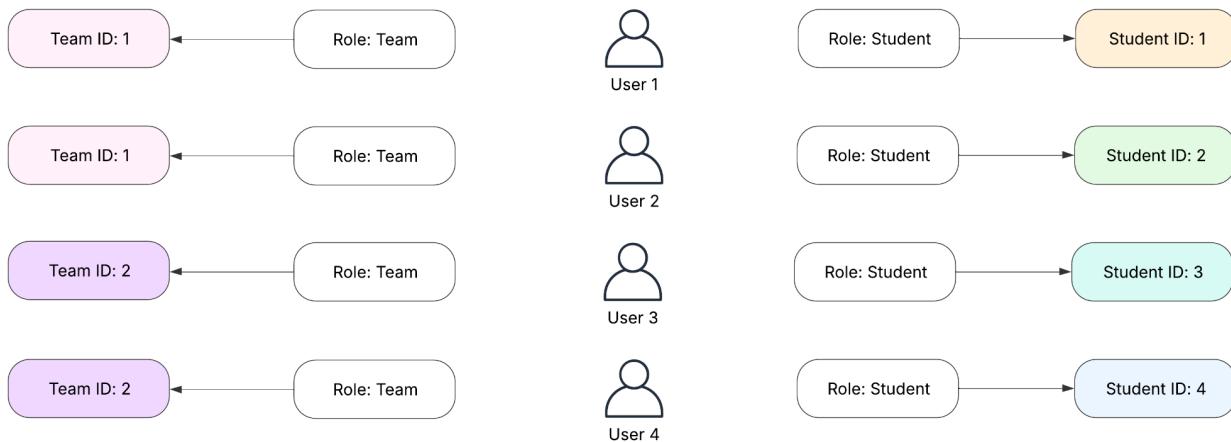
- Login Pages
- Student Views
  - Dashboard
  - Forms
  - Quizzes
  - Calendar
  - Project
  - Discussions
- Professor Views
  - Dashboard
  - Forms Management
  - Announcements
  - Calendar
  - Discussions
  - People
- TA Views:
  - Announcements
  - Team Management
  - Gradeables
  - Discussion
  - Calendar

The views actively refresh by using data from the databases, either due to requests from the user, or due to server wanting to connect and refresh.

## 2.2 Role-Based Access Control and Role-ID Based Architecture

Role-Based Access Control (RBAC) is the idea of assigning users different levels of access or permissions based on their role. It offers a simple approach to access management and provides an easy way to implement permissions and access to data. This is crucial for an application empowering academic courses, due to the various divisions in roles (Professors, TA's, Students) as well as team based roles for collaborative work.

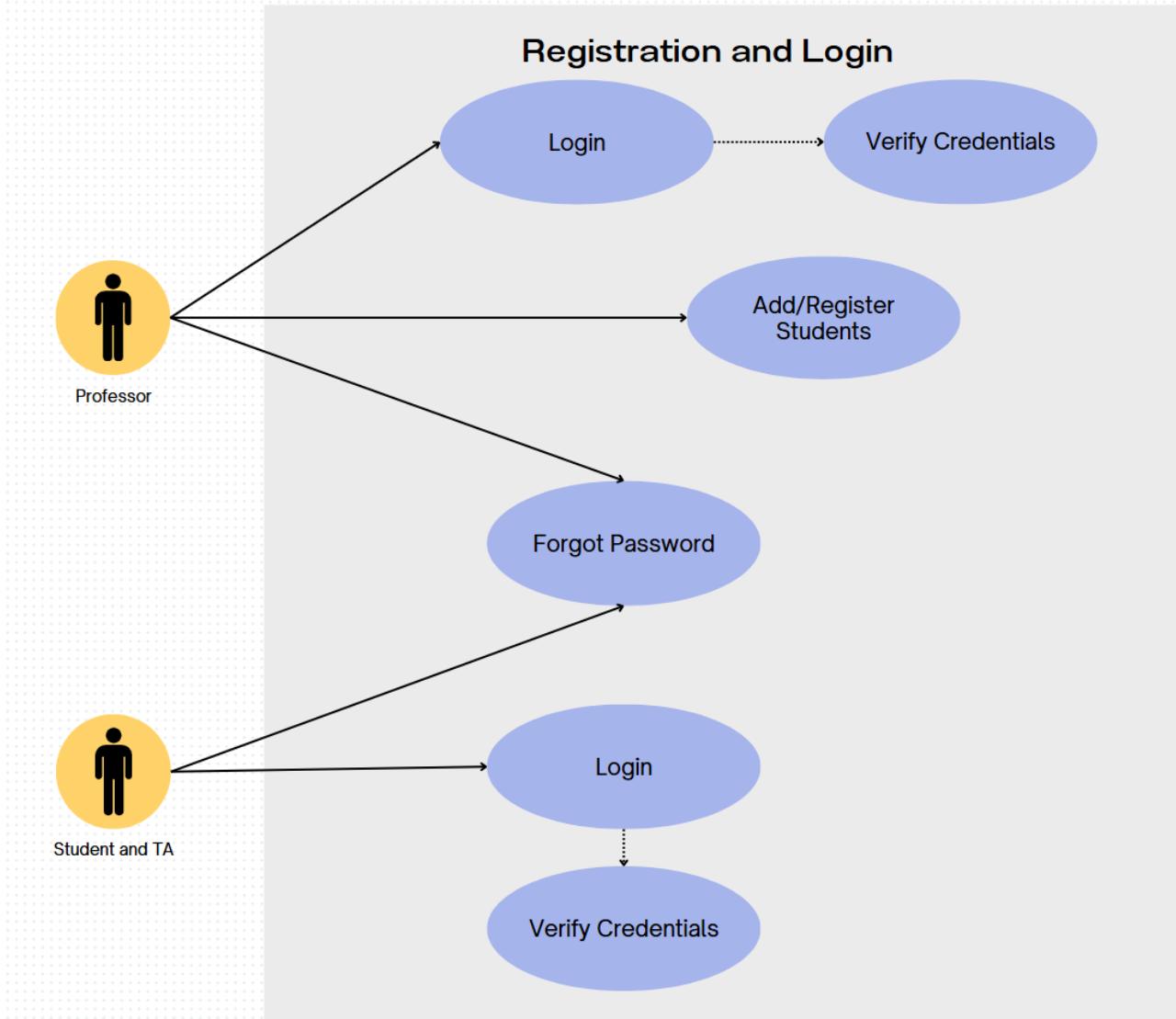
Role-ID Based Architecture is our novel solution to make it easier for features requiring collaboration, collective actions, etc. Each user on the platform with a certain *role* possesses a corresponding *role ID*, which acts as a differentiator for that specific role. For example, each student with the *student* role would have a unique *student role ID*. Each student could also have the role *team*. Students in the same team would have the same *team role ID*. Any data corresponding to the *team* role, would be visible the same way to students with the same *team role ID*. This architecture is particularly useful in implementing the collaborative features, such as calendars, team submissions, etc. Users with the same *role ID* see the same content which is synced on the servers and updates reflect across users. So, a team member creating a calendar event for the role *team*, would allow it to be visible to the whole team. Similarly, this makes it easier to implement forms requiring a team submission, and approval of all members before submission. This model allows for each user to have an individual or shared identity corresponding to each role, making it suitable for allowing features based on both tracks.



## 3 Object Oriented Design

### 3.1 Use Case Diagrams

#### 1. Login and Registration



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To enable user authentication (Login and Verify Credentials), account recovery (Forgot Password), and student management (Add/Register Students).

**Requirements Traceability** - This feature ensures secure access for different user roles (Professor, Student, TA), allows account recovery, and facilitates student enrollment into the system.

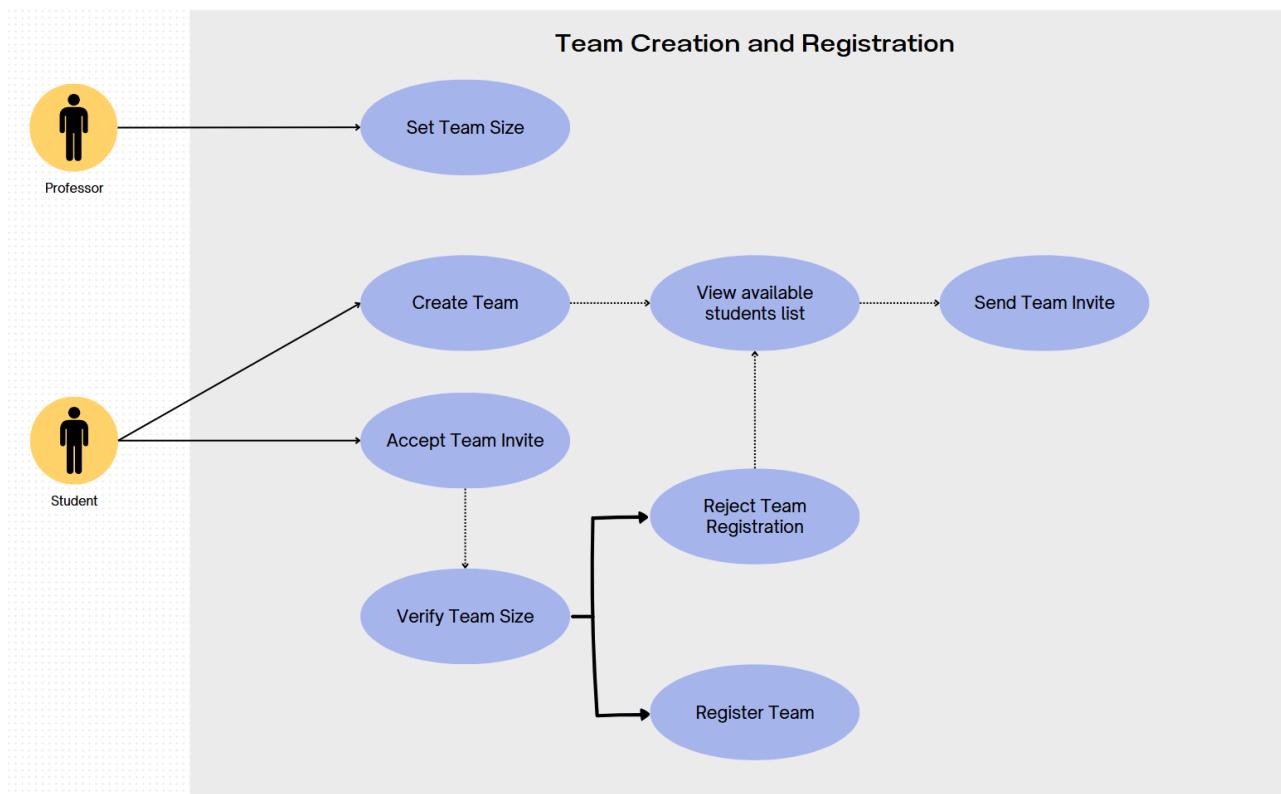
**Priority** - This use case has a high priority because user access and management are fundamental to the system's operation.

**Pre-conditions** - Users must have valid credentials to log in. For "Forgot Password", users need a registered email address. Professors need to be logged in to add/register students.

**Post-conditions** - Users are granted access upon successful login. "Forgot Password" provides password reset instructions. Professors can manage student enrollment after adding/registering them.

**Actors** - Actors in this use case are Professors, Students, and TAs.

## 2. Team Formation



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To manage the creation and registration of student teams.

**Requirements Traceability** - This feature allows professors to set team sizes, create teams, view available students, and send invites. Students can accept or reject invites, verify team sizes, and register their teams.

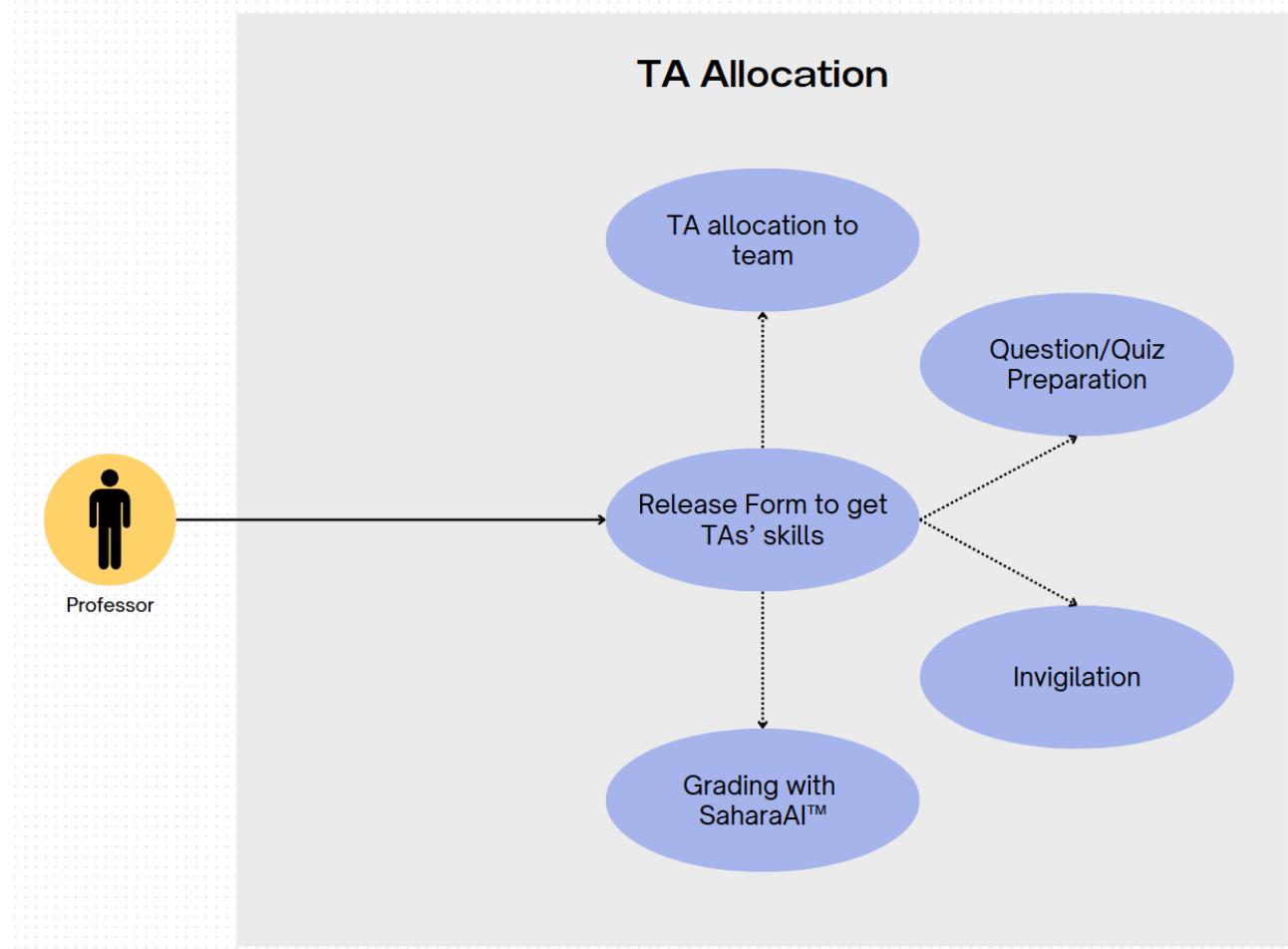
**Priority** - This use case has a high priority as it supports collaborative learning and project-based activities.

**Pre-conditions** - Professors must be logged in to set team size. Students must be registered to create a team, receive and respond to invites.

**Post-conditions** - Teams are formed and registered. Professors can track team compositions and manage team-based assignments.

**Actors** - Actors in this use case are Professors and Students.

### 3. TA Allocation



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To outline the process of allocating Teaching Assistants (TAs) to various tasks based on their skills.

**Requirements Traceability** - This feature ensures the efficient utilization of TAs by matching their skills with relevant tasks such as team allocation, quiz preparation, invigilation, and grading.

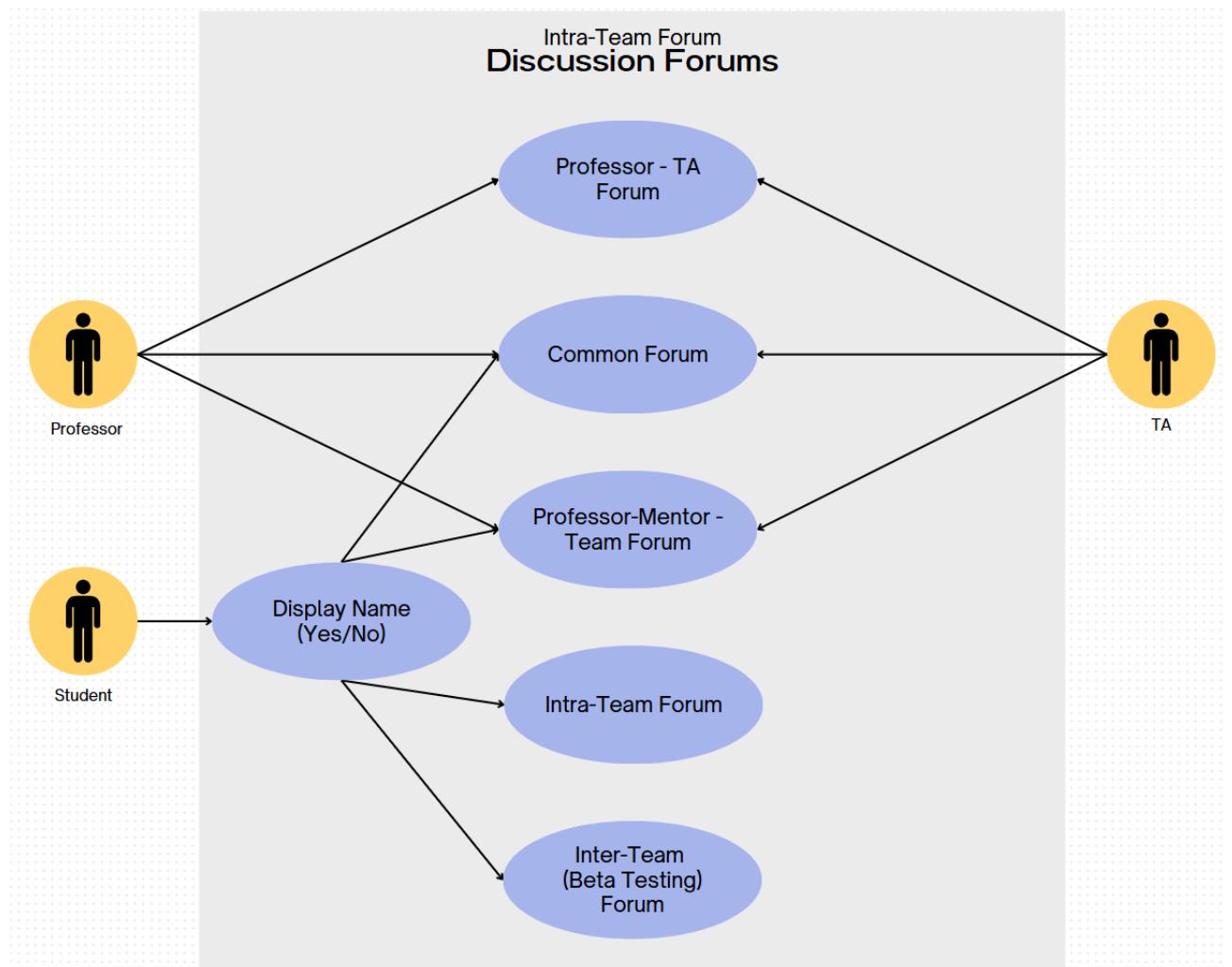
**Priority** - This use case has a medium priority as it optimizes resource allocation and supports effective teaching assistance.

**Pre-conditions** - A professor needs to be logged in to allocate TAs. A "Release Form" or skill assessment must be available to identify TAs' expertise.

**Post-conditions** - TAs are assigned to suitable tasks based on their skills. Professors can leverage TAs for quiz preparation, invigilation, and grading activities.

**Actors** - Actors in this use case are Professors and TAs.

#### 4. Forums



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To provide various communication channels for different groups within the educational setting.

**Requirements Traceability** - This feature ensures effective communication between different stakeholders in the educational process.

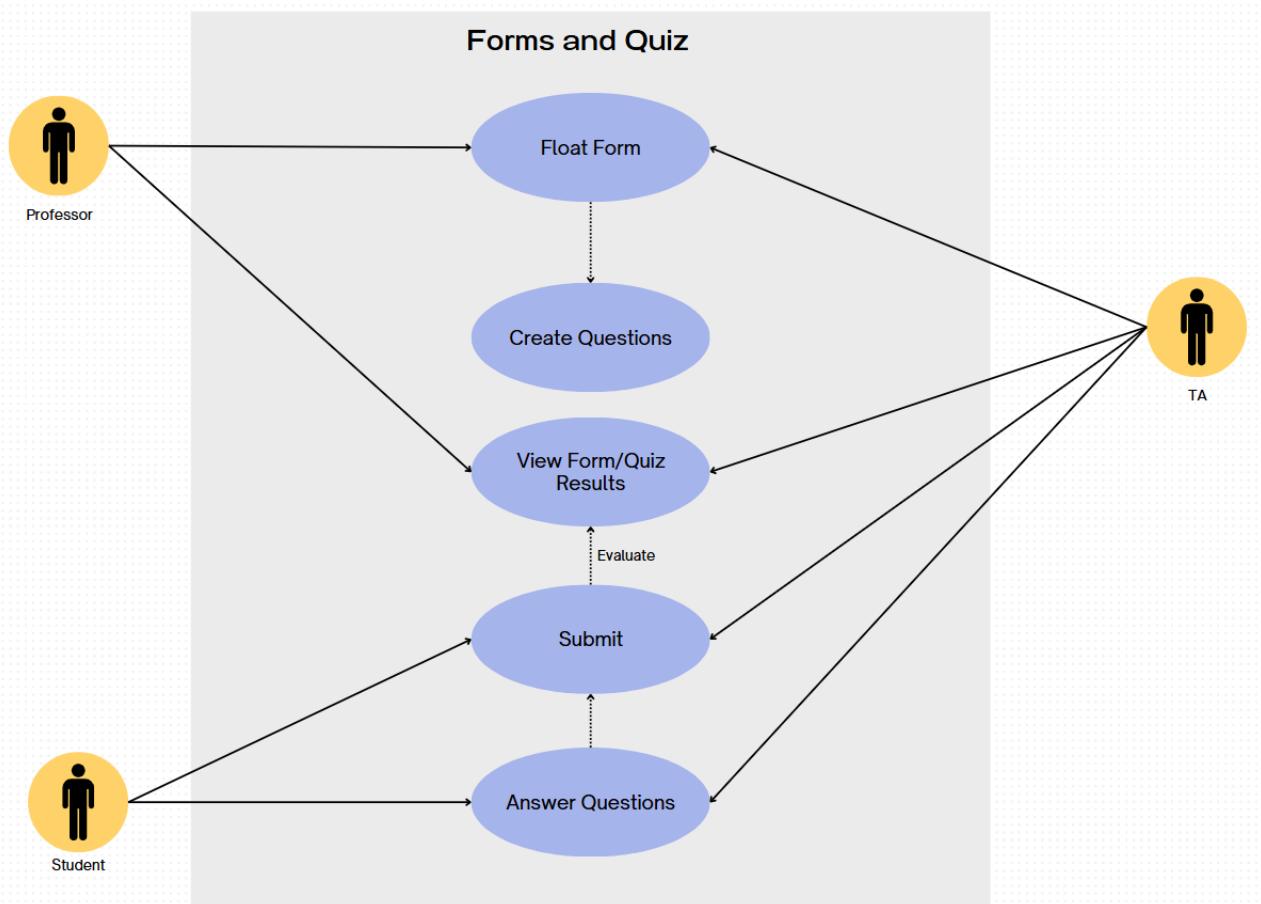
**Priority** - This use case has a high priority as communication is vital for collaborative learning and project management.

**Pre-conditions** - Users must be registered and have appropriate access rights to participate in forums.

**Post-conditions** - Users can engage in discussions in appropriate forums based on their roles and preferences.

**Actors** - Actors in this use case are Professors, TAs, and Students.

## 5. Quiz and Form



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To facilitate the process of creating, distributing, and evaluating forms and quizzes.

**Requirements Traceability** - This feature enables professors to float forms, create questions, and view results. It also allows students to answer and submit forms/quizzes, and TAs to assist in the evaluation process.

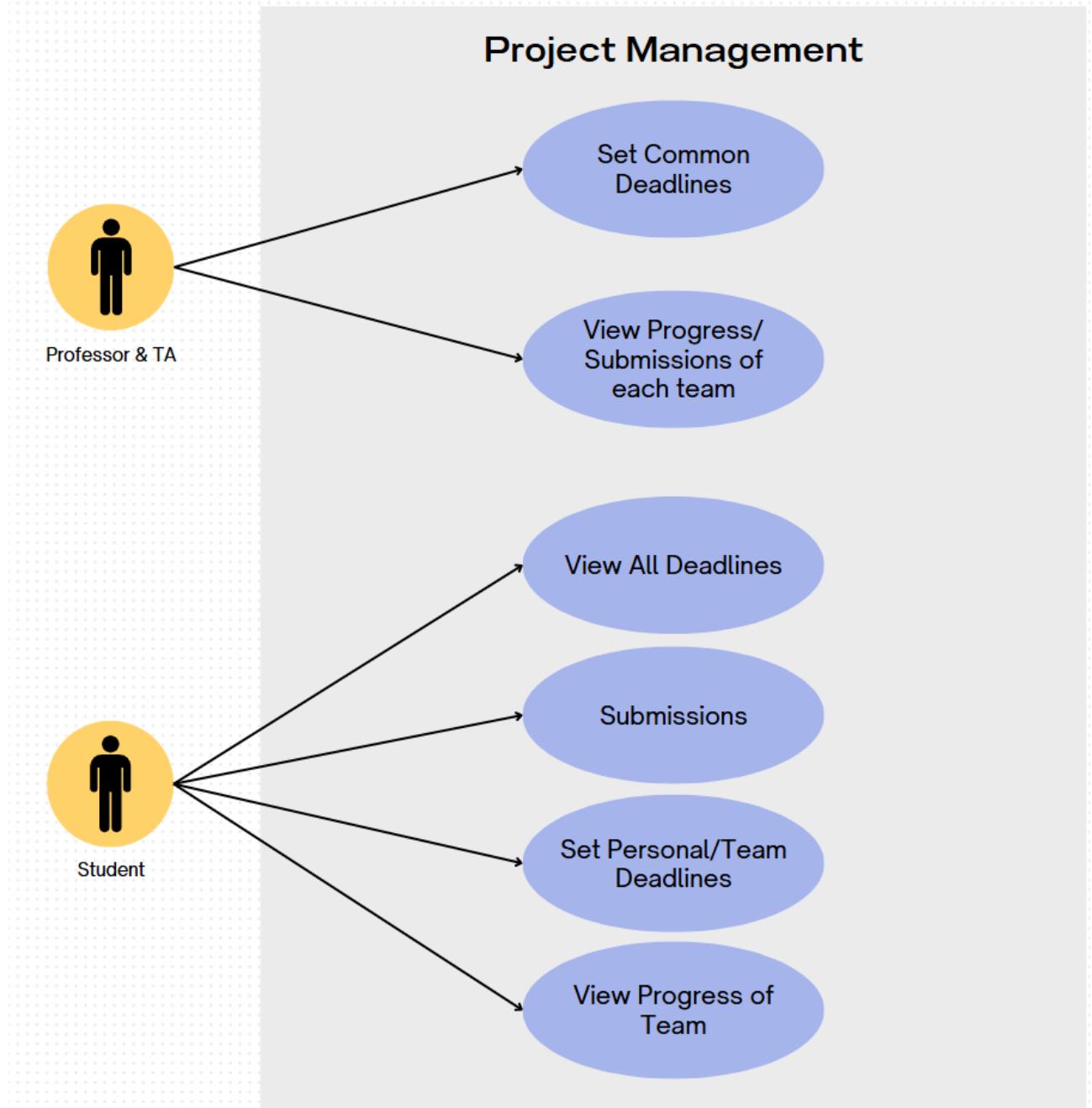
**Priority** - This use case has a medium priority because assessments are a core part of the learning process.

**Pre-conditions** - Professors must be logged in to float forms and create questions. Students need to be registered to answer and submit.

**Post-conditions** - Professors can collect and view student responses. TAs can evaluate the submissions.

**Actors** - Actors in this use case are Professors, Students, and TAs.

## **6. Project Tracking**



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To manage project deadlines, track progress, and facilitate submissions for both professors/TAs and students.

**Requirements Traceability** - This feature ensures effective project timeline management and progress monitoring.

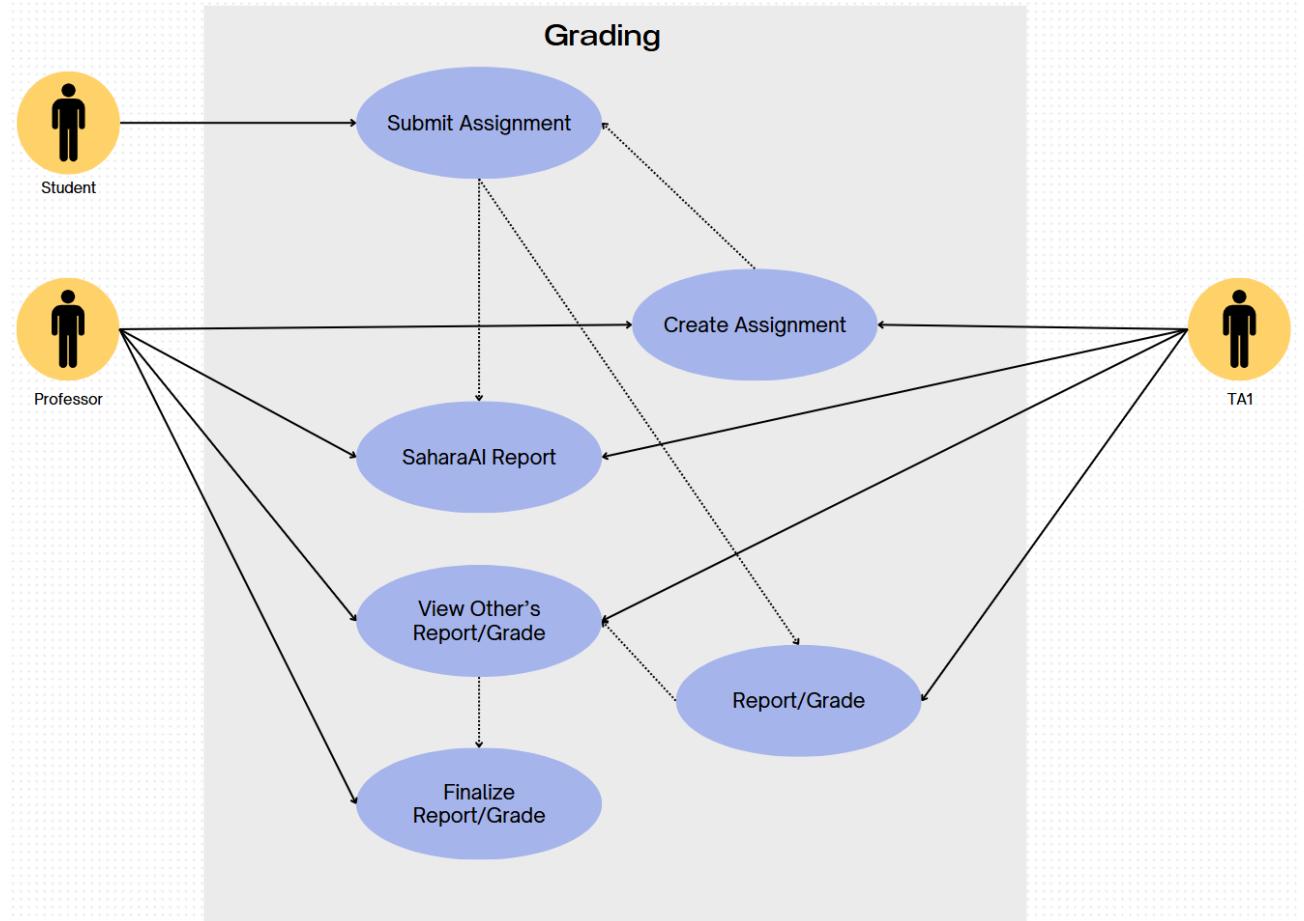
**Priority** - This use case has a high priority as it's crucial for keeping projects on track and meeting educational goals.

**Pre-conditions** - Projects must be assigned, and teams must be formed.

**Post-conditions** - Deadlines are set and tracked, submissions are managed, and progress is monitored.

**Actors** - Actors in this use case are Professors, TAs, and Students.

## 7. Assignment Grading



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To manage the assignment submission and grading process, including the use of AI-assisted grading.

**Requirements Traceability** - This feature ensures a structured workflow for assignment creation, submission, grading, and review.

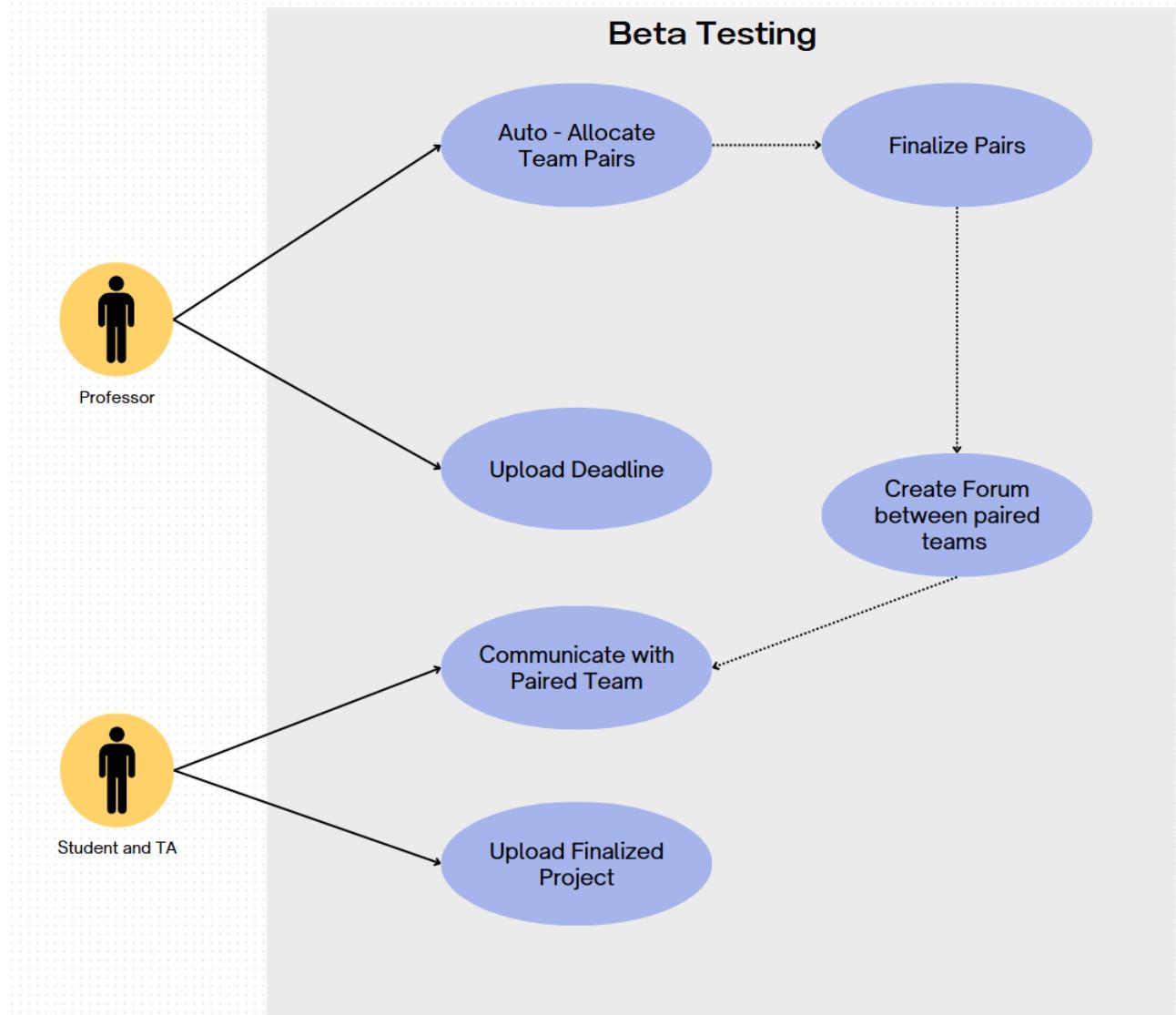
**Priority** - This use case has a high priority as it's essential for evaluating student performance and providing feedback.

**Pre-conditions** - Assignments must be created by the professor or TA, and students must complete their work for submission.

**Post-conditions** - Assignments are graded, reports are generated, and final grades are recorded.

**Actors** - Actors in this use case are Professors, Students, and TAs.

## 8. Beta Testing



**Author** - This use case was written by Spandan and Charan.

**Purpose** - To facilitate beta testing of projects by pairing teams and enabling communication between them.

**Requirements Traceability** - This feature ensures efficient team pairing, deadline management, and inter-team communication for beta testing purposes.

**Priority** - This use case has a high priority as it's crucial for the peer review and improvement process of student projects.

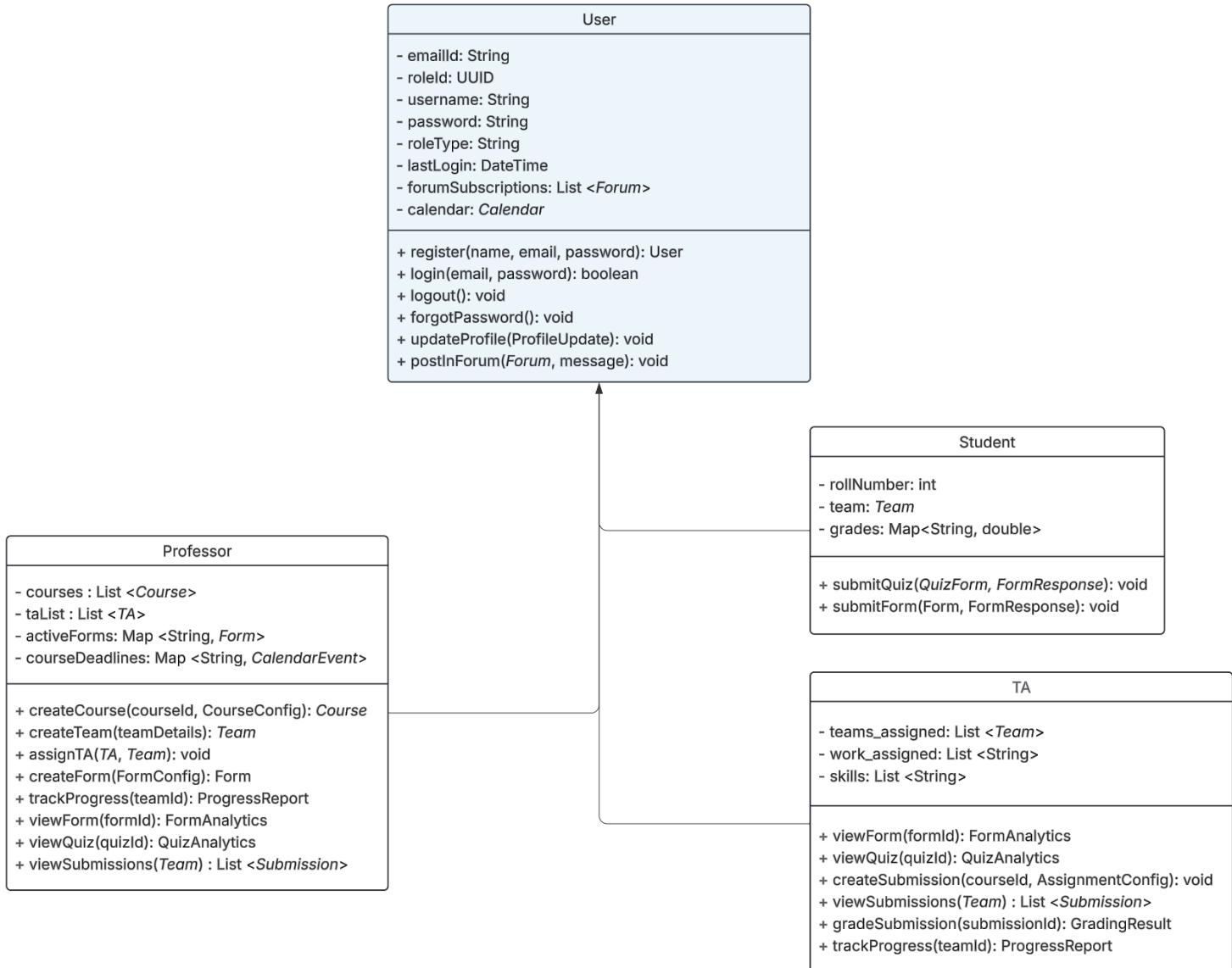
**Pre-conditions** - Teams must be formed, and projects must be at a stage ready for beta testing.

**Post-conditions** - Teams are paired, forums are created for communication, and finalized projects are uploaded.

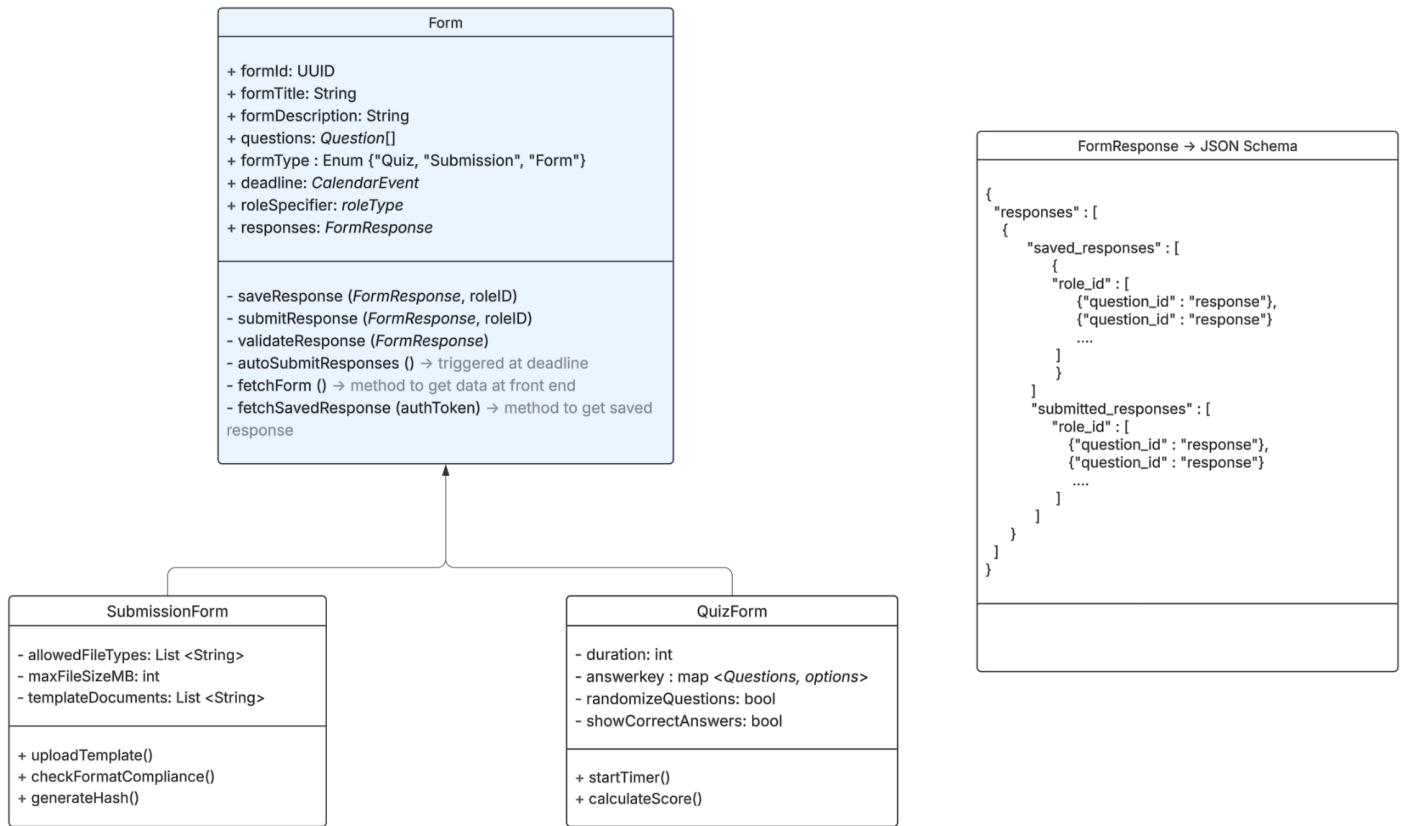
**Actors** - Actors in this use case are Professors, Students, and TAs.

## 3.2 Class Diagrams

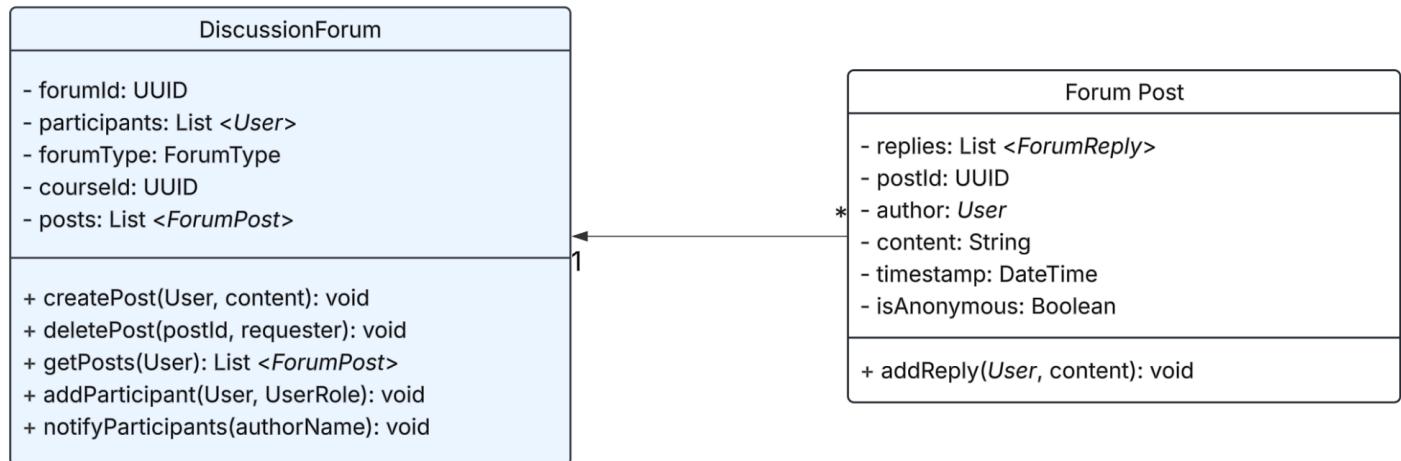
### 1. Class Diagram 1



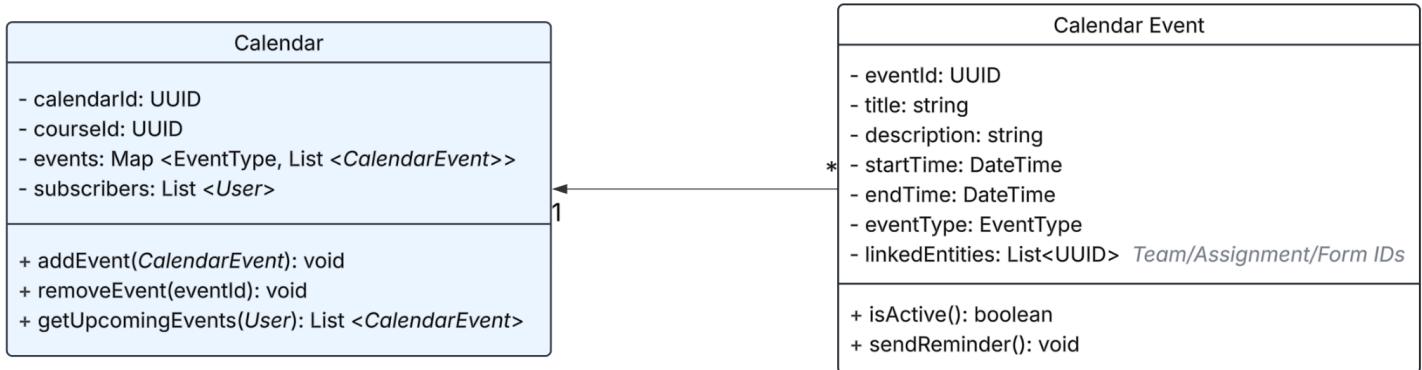
## 2. Class Diagram 2



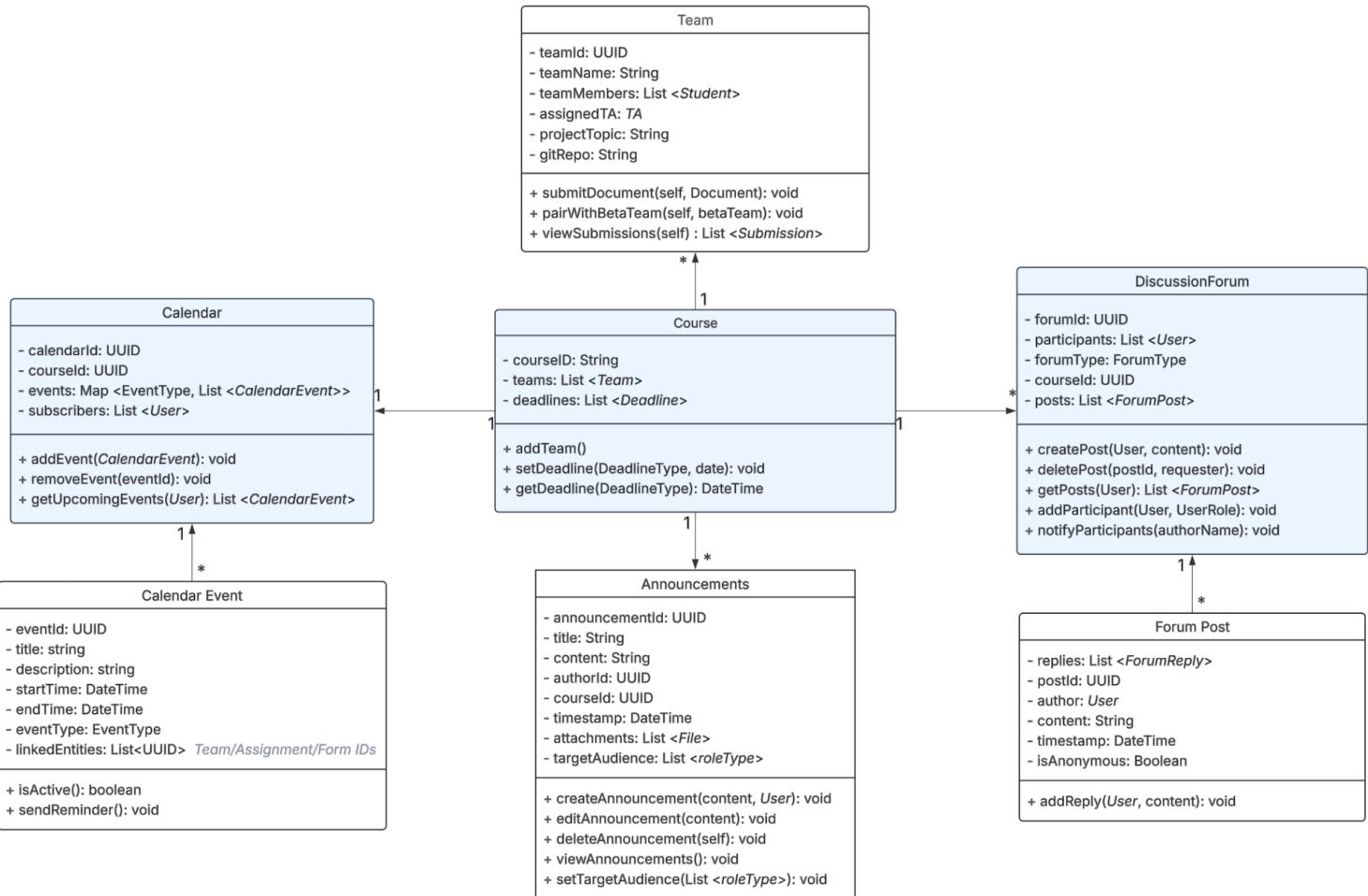
## 3. Class Diagram 3



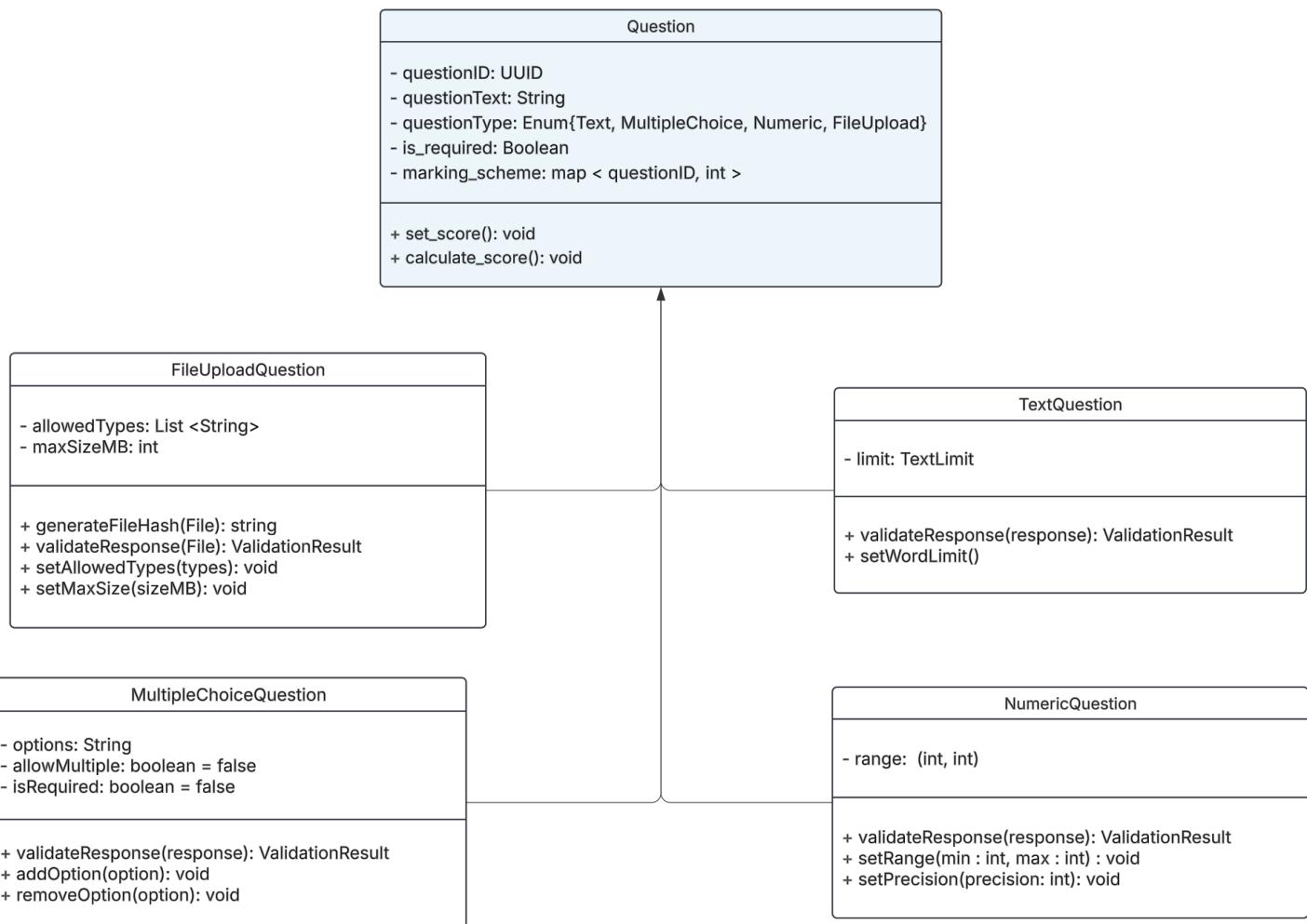
## 4. Class Diagram 4



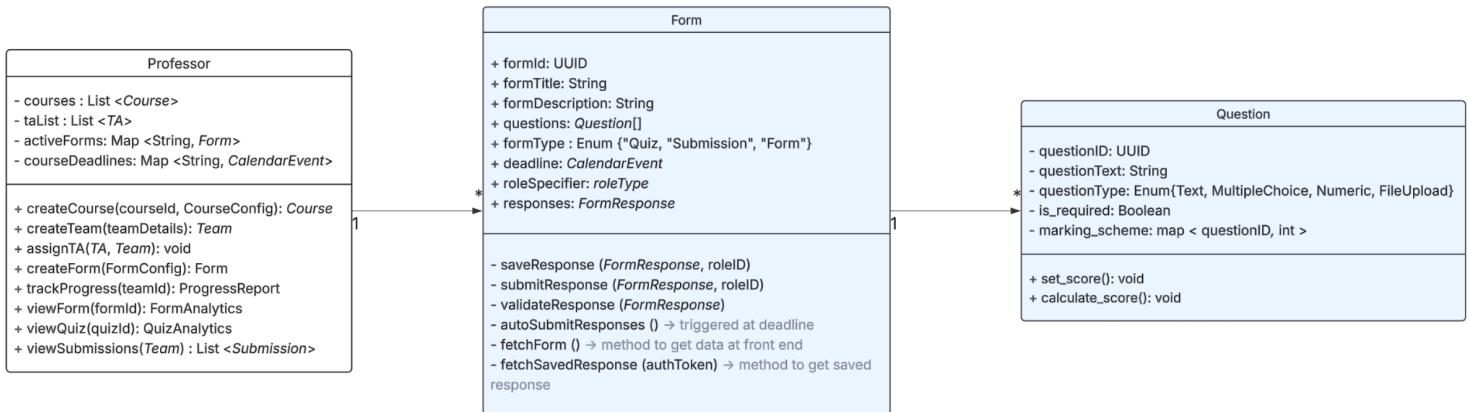
## 5. Class Diagram 5



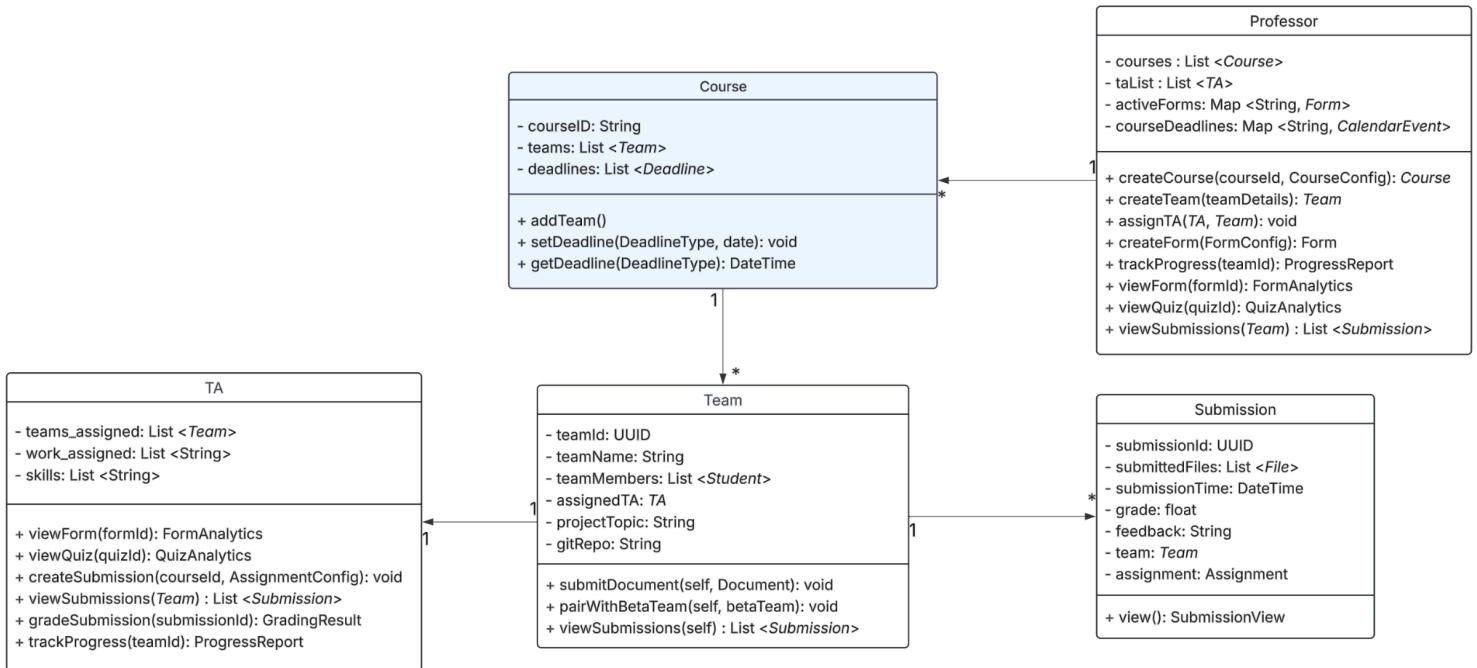
## 6. Class Diagram 6



## 7. Class Diagram 7



## 8. Class Diagram 8



### User Class:

- Attributes

- emailId - The email id of the user
- roleID - The role id of the user (to be used as a unique identifier)
- username - The username of the user
- password - The password for login
- roleType - The role assigned to the user
- lastLogin - Timestamp of last login of the user
- forumSubscriptions - List of subscribed forums of the user
- calendar - The calendar associated with the user

- Methods

- login() - takes username and argument and logs in the user
- logout() - logs out the user
- forgotPassword() - takes emailId as argument and allows the user to set a new password
- register() - takes name, email and password of user as arguments and allows the user to register himself onto the site
- updateProfile() - allows the user to update his/her profile on the site.
- postInForum() - takes the forum and message as arguments and enables the user to post a message in the forum

## Professor class

- **Attributes**

- courses - List of courses handled by the Professor
- taList - List of TAs working under the Professor
- activeForms - List of active/open forms created by the Professor
- courseDeadlines - List of deadlines associated with the course taken by the Professor

- **Methods**

- createCourse() - takes course configurations as arguments and creates a Course
- createTeam() - takes team details as arguments and creates a Team
- assignTA() - assigns a TA to a team using skill based matching
- createForm() - takes form configurations as arguments and creates a Form
- trackProgress() - takes teamID as argument and generates a ProgressReport of the Team
- viewForm() - takes formID as argument and generates FormAnalytics of the Form
- viewQuiz() - takes quizID as argument and generates QuizAnalytics of the Quiz
- viewSubmissions() - takes Team Details as argument and displays the submissions made by the Team

## TA class

- **Attributes**

- teams\_assigned - List of teams assigned to the TA
- work\_assigned - Work assigned to the TA (eg - grading, team mentoring, creating assignments etc.)
- skills - List of technical skills the TA is comfortable in and the level of expertise he/she in each of them

- **Methods**

- trackProgress() - takes teamID as argument and generates a ProgressReport of the Team
- viewForm() - takes formID as argument and generates FormAnalytics of the Form
- viewQuiz() - takes quizID as argument and generates QuizAnalytics of the Quiz
- viewSubmissions() - takes Team Details as argument and displays the submissions made by the Team
- createSubmission() - takes assignment configurations as argument and creates a submission for the Teams/Students
- gradeSubmission() - takes submissionID as argument and generates the graded result of the Submission

## Student Class

- **Attributes**

- rollNumber - the roll number of the Student
- team - the Team the student belongs to
- grades - The grades obtained by the student in the submissions, quizzes, etc.

- **Methods**

- submitQuiz() - takes the QuizForm and FormResponse as arguments and submits the quiz
- submitForm() - takes the Form and FormResponse as arguments and submits the form

## Form Class

- **Attributes**

- formID - The form ID of the Form (acts as a unique identifier)
- formTitle - The title of the Form
- formDescription - The description of the Form
- questions - List of questions present in the Form
- formType - The formtype (for eg. Quiz, Submission, Form) of the Form
- deadline - The deadline for completion of the Form
- roleSpecifier - The target audience of the Form
- responses - The responses to the Form (stored as a JSON file)

- **Methods**

- saveResponse() - takes the FormReponse and roleId as arguments and saves the responses
- submitResponse() - takes the FormResponse and roleId as arguments and submits the responses
- validateResponse() - validates the FormResponse, i.e, checks whether the responses to the Form are valid or not
- autoSubmitResponse() - submitResponse() is triggered at deadline of the Form
- fetchForm() - displays the Form at the frontend of the site
- fetchSavedResponse() - takes the authToken of the user as arguments and displays the saved responses to the Form

## Submission Form Class

- **Attributes**

- allowedFileTypes - List of the allowed file types of the submission
- maxFileSizeMB - the maximum acceptable file size of the submission
- templateDocuments - List of reference template documents for the submission

- **Methods**

- uploadTemplate() - Method to upload template documents
- checkFormatCompliance() - validates if submitted files meet format requirements
- generateHash() - generates hash for file integrity verification

## Quiz Form Class

- **Attributes**

- duration - Duration allowed for the quiz
- answerKey - Mapping of questions to correct answers
- randomizeQuestions - Whether to randomize question order
- showCorrectAnswers - Whether to display correct answers after submission

- **Methods**

- startTimer() - Starts the timer of the quiz
- calculateScore() - Calculates the score of the quiz

## Questions Class

- **Attributes**

- questionId - a unique identifier for the question
- questionText - The content of the question
- questionType - The Type of question, i.e, FileUpload, MultipleChoice, Numeric, etc.
- is\_required - Determines if the question is necessary to attempt
- marking\_scheme - Scoring scheme for the question

- **Methods**

- set\_score() - Set score for the question
- calculate\_score() - Calculate score based on response

## TextQuestion Class

- **Attributes**

- limit - Word/character limit for text response

- **Methods**

- validateResponse() - Validates the text response
- setWordLimit() - Sets word limit for the response

## NumericQuestion Class

- **Attributes**
  - range - Acceptable range for numeric input
- **Methods**
  - validateResponse() - Validates numeric input
  - setRange() - Sets valid range for the response
  - setPrecision - Sets decimal precision for the response

## MultipleChoiceQuestion Class

- **Attributes**
  - options - Available choices
  - allowMultiple - Allow multiple selections
  - isRequired - Whether response is required
- **Methods**
  - validateResponse() - Validates selection
  - addOption() - Add new option
  - removeOption() - Remove existing option

## FileUploadQuestion Class

- **Attributes:**
  - allowedTypes: List<String> - Permitted file types
  - maxSizeMB: int - Maximum file size limit
- **Methods:**
  - generateFileHash(): string - Generate hash for file integrity
  - validateResponse(): ValidationResult - Validates file upload
  - setAllowedTypes(): void - Set permitted file types
  - setMaxSize(): void - Set maximum file size

## DiscussionForum Class

- **Attributes:**
  - forumId: UUID - Unique identifier for the forum

- participants: List<User> - List of users participating in the forum
- forumType: ForumType - Type of forum (GLOBAL/TEAM\_ONLY/TEAM\_TA\_PROF)
- courseld: UUID - Associated course identifier
- posts: List<ForumPost> - Collection of posts in the forum

- **Methods:**

- createPost(): void - Create a new forum post
- deletePost(): void - Delete an existing post
- getPosts(): List<ForumPost> - Get list of forum posts
- addParticipant(): void - Add a new participant to the forum
- notifyParticipants(): void - Notify participants of new activity

## ForumPost Class

- **Attributes:**

- forumId: UUID - Unique identifier for the forum
- participants: List<User> - List of users participating in the forum
- forumType: ForumType - Type of forum (GLOBAL/TEAM\_ONLY/TEAM\_TA\_PROF)
- courseld: UUID - Associated course identifier
- posts: List<ForumPost> - Collection of posts in the forum

- **Methods:**

- createPost(): void - Create a new forum post
- deletePost(): void - Delete an existing post
- getPosts(): List<ForumPost> - Get list of forum posts
- addParticipant(): void - Add a new participant to the forum
- notifyParticipants(): void - Notify participants of new activity

## Calendar Class

- **Attributes:**

- calendarId: UUID - Unique identifier for the calendar
- courseld: UUID - Associated course identifier
- events: Map<EventType, List<CalendarEvent>> - Collection of events organized by type
- subscribers: List<User> - List of users subscribed to the calendar

- **Methods:**

- addEvent(): void - Add a new event to the calendar
- removeEvent(): void - Remove an existing event from the calendar
- getUpcomingEvents(): List<CalendarEvent> - Retrieve upcoming events for a user

## Calendar Event Class

- **Attributes:**

- eventId: UUID - Unique identifier for the event
- title: string - Title of the event
- description: string - Detailed description of the event
- startTime: DateTime - Start time of the event
- endTime: DateTime - End time of the event
- eventType: EventType - Type of the event (e.g., deadline, milestone)
- linkedEntities: UUID[] - Associated Team/Assignment/Form IDs

- **Methods:**

- isActive(): boolean - Check if the event is currently active
- sendReminder(): void - Send a reminder for the event

## Team Class

- **Attributes:**

- teamId: UUID - Unique identifier for team
- teamName: String - Name of the team
- teamMembers: List<Student> - List of student members
- assignedTA: TA - Assigned teaching assistant
- projectTopic: String - Team's project topic
- gitRepo: String - Git repository link

- **Methods:**

- submitDocument(): void - Submit project document
- pairWithBetaTeam(): void - Pair with another team for beta testing
- viewSubmissions(): List<Submission> - View team's submissions

## Course Class

- **Attributes:**

- forumId: UUID - Unique identifier for the forum

- participants: List<User> - List of users participating in the forum
- forumType: ForumType - Type of forum (GLOBAL/TEAM\_ONLY/TEAM\_TA\_PROF)
- courseId: UUID - Associated course identifier
- posts: List<ForumPost> - Collection of posts in the forum

- **Methods:**

- createPost(): void - Create a new forum post
- deletePost(): void - Delete an existing post
- getPosts(): List<ForumPost> - Get list of forum posts
- addParticipant(): void - Add a new participant to the forum
- notifyParticipants(): void - Notify participants of new activity

## Announcements Class

- **Attributes:**

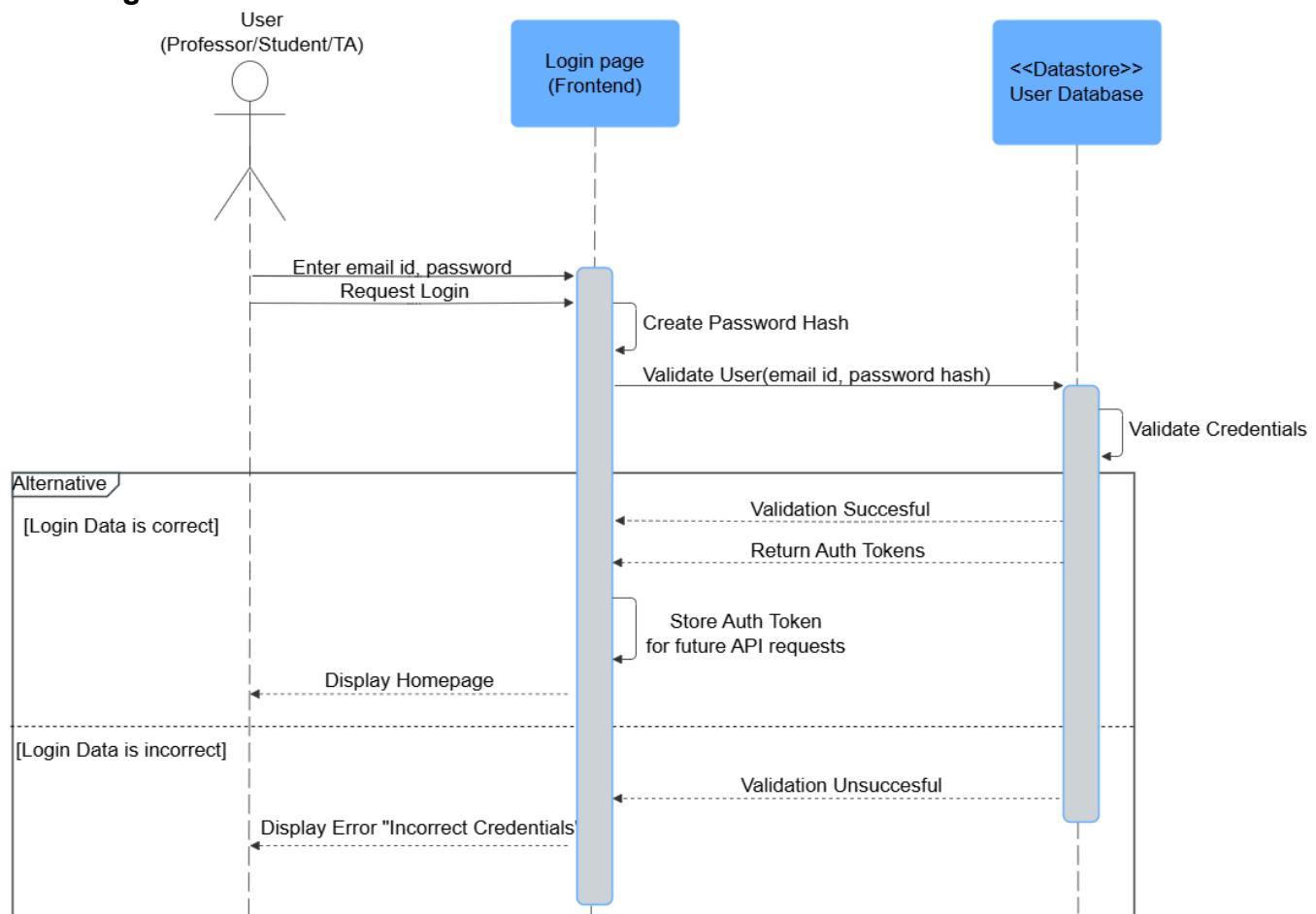
- announcementId: UUID - Unique identifier for announcement
- title: String - Announcement title
- content: String - Announcement content
- authorId: UUID - ID of announcement creator
- courseId: UUID - Associated course ID
- timestamp: DateTime - Creation time
- attachments: List<File> - Attached files
- targetAudience: List<roleType> - Target audience role

- **Methods:**

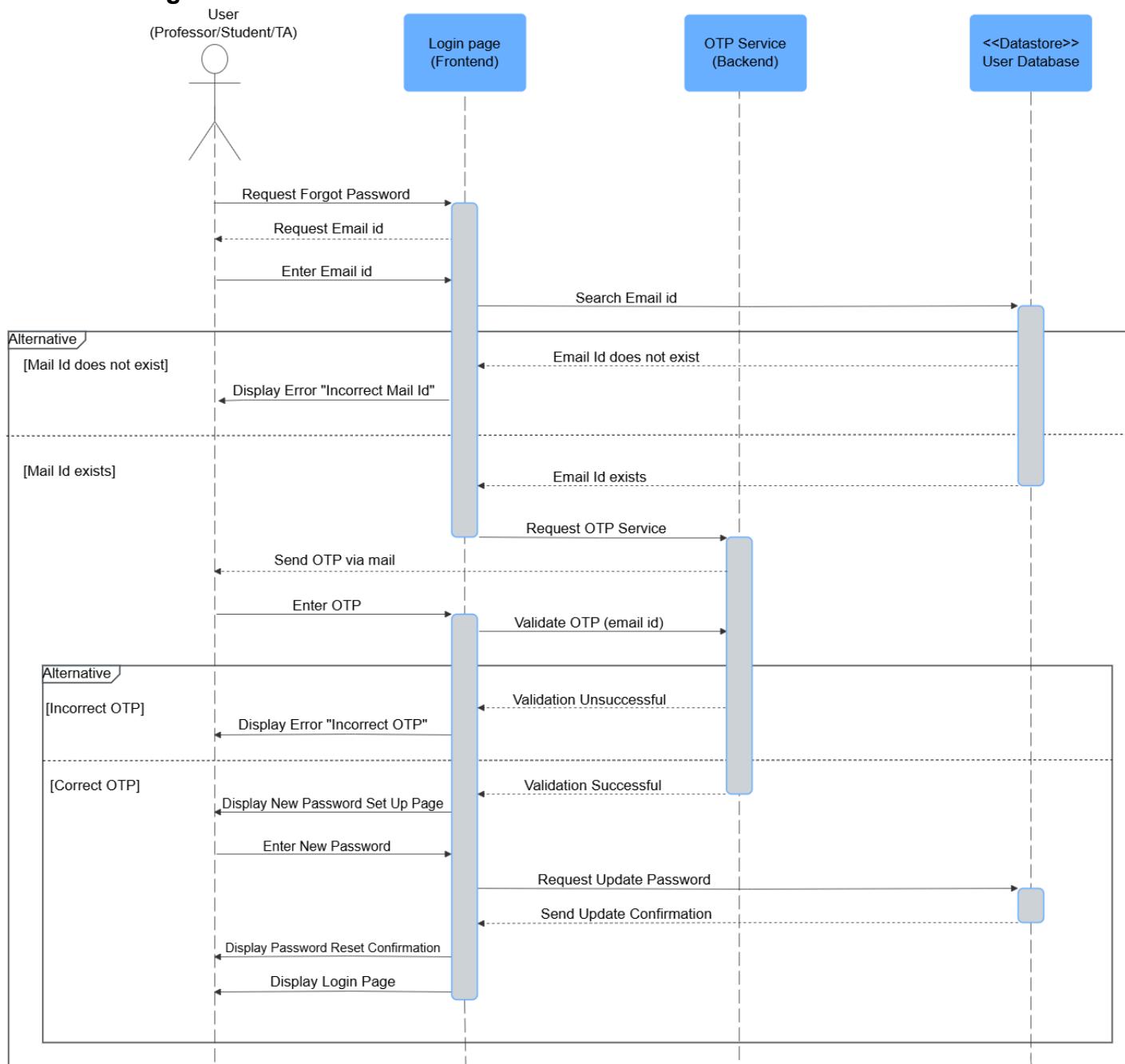
- createAnnouncement(): void - Create new announcement
- editAnnouncement(): void - Edit existing announcement
- deleteAnnouncement(): void - Delete announcement
- viewAnnouncements(): void - View announcements
- setTargetAudience(): void - Set target audience for announcement

### 3.3 Sequence Diagrams

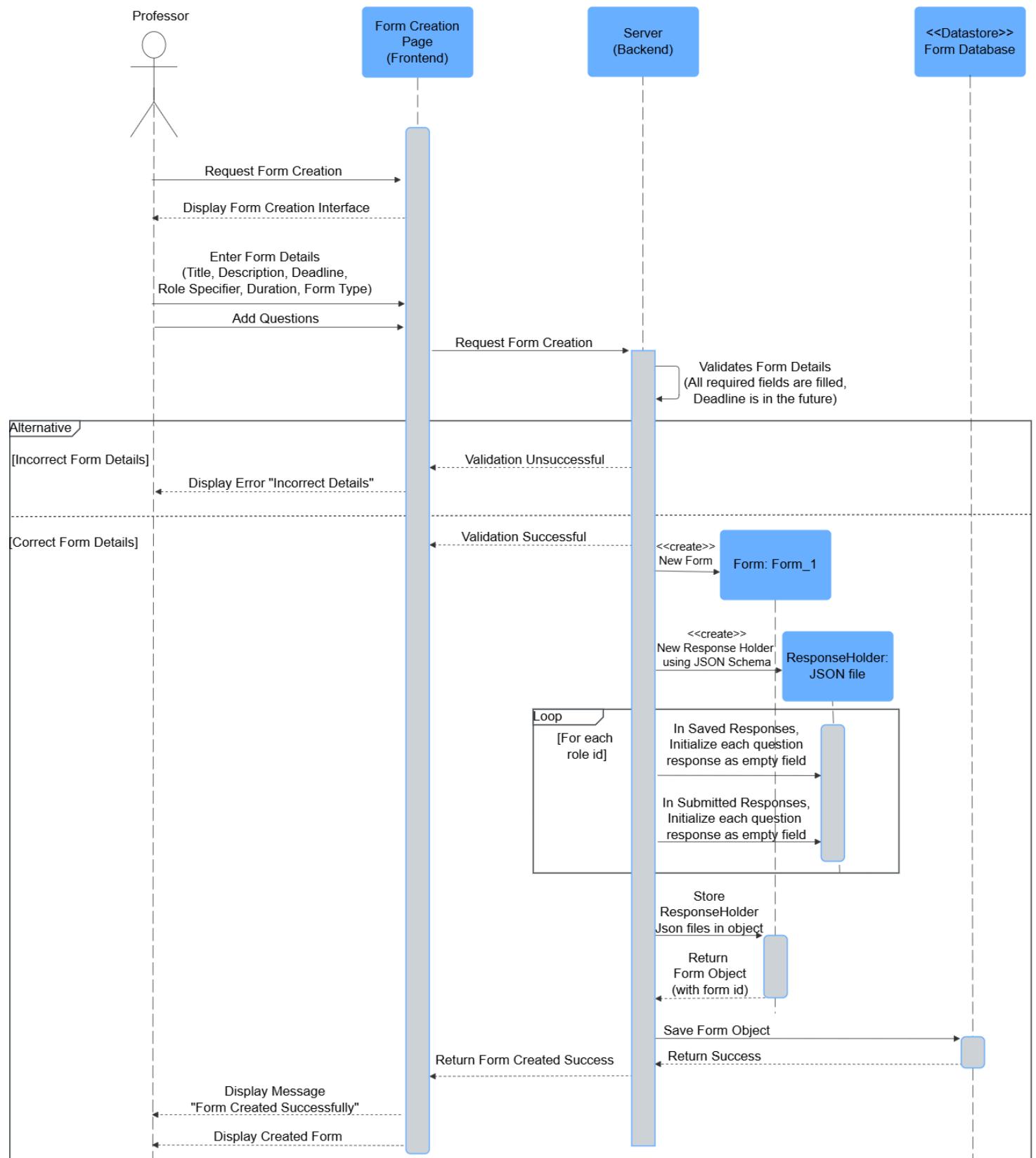
#### 3.3.1 Login



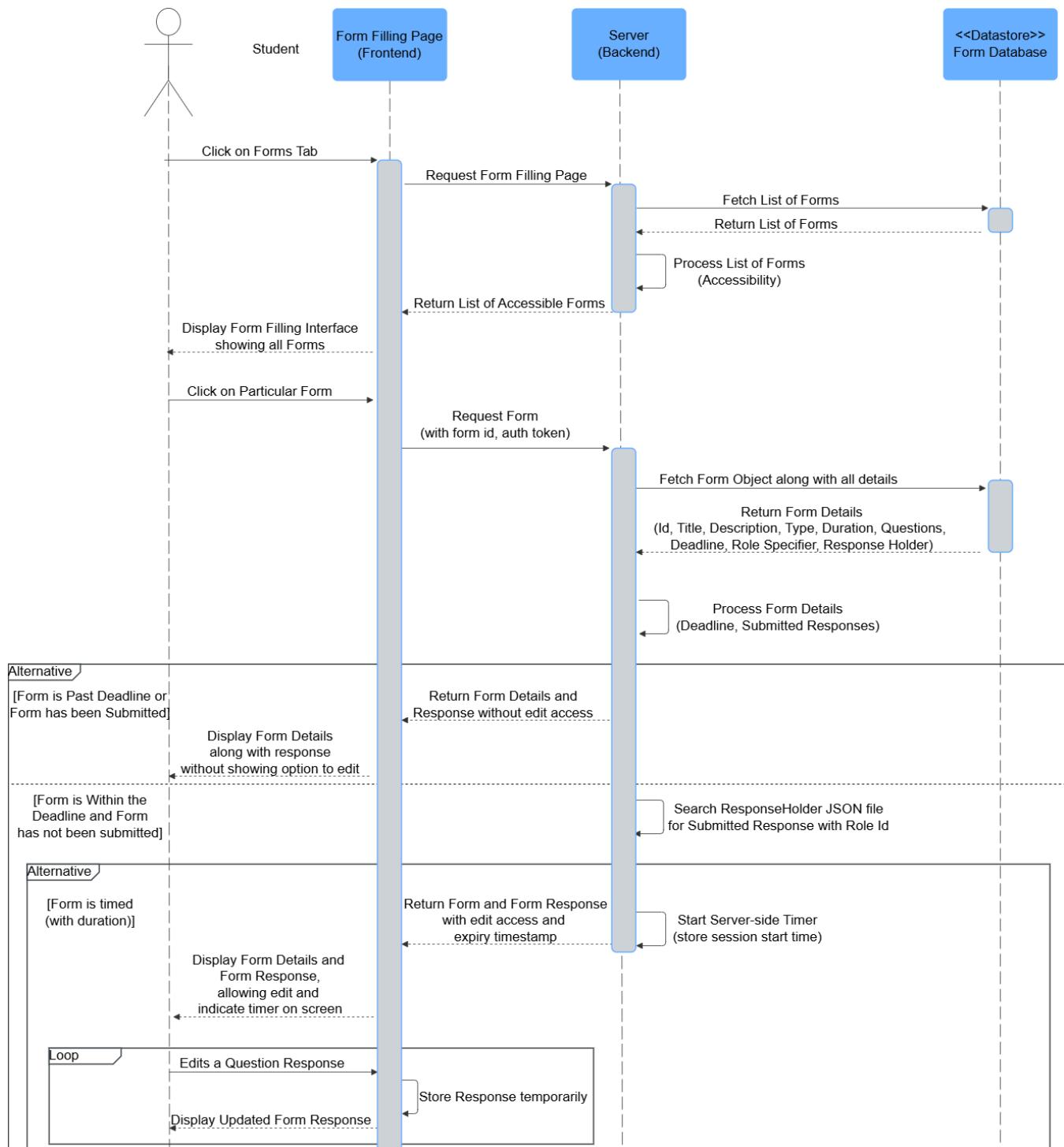
### 3.3.2 Forgot Password

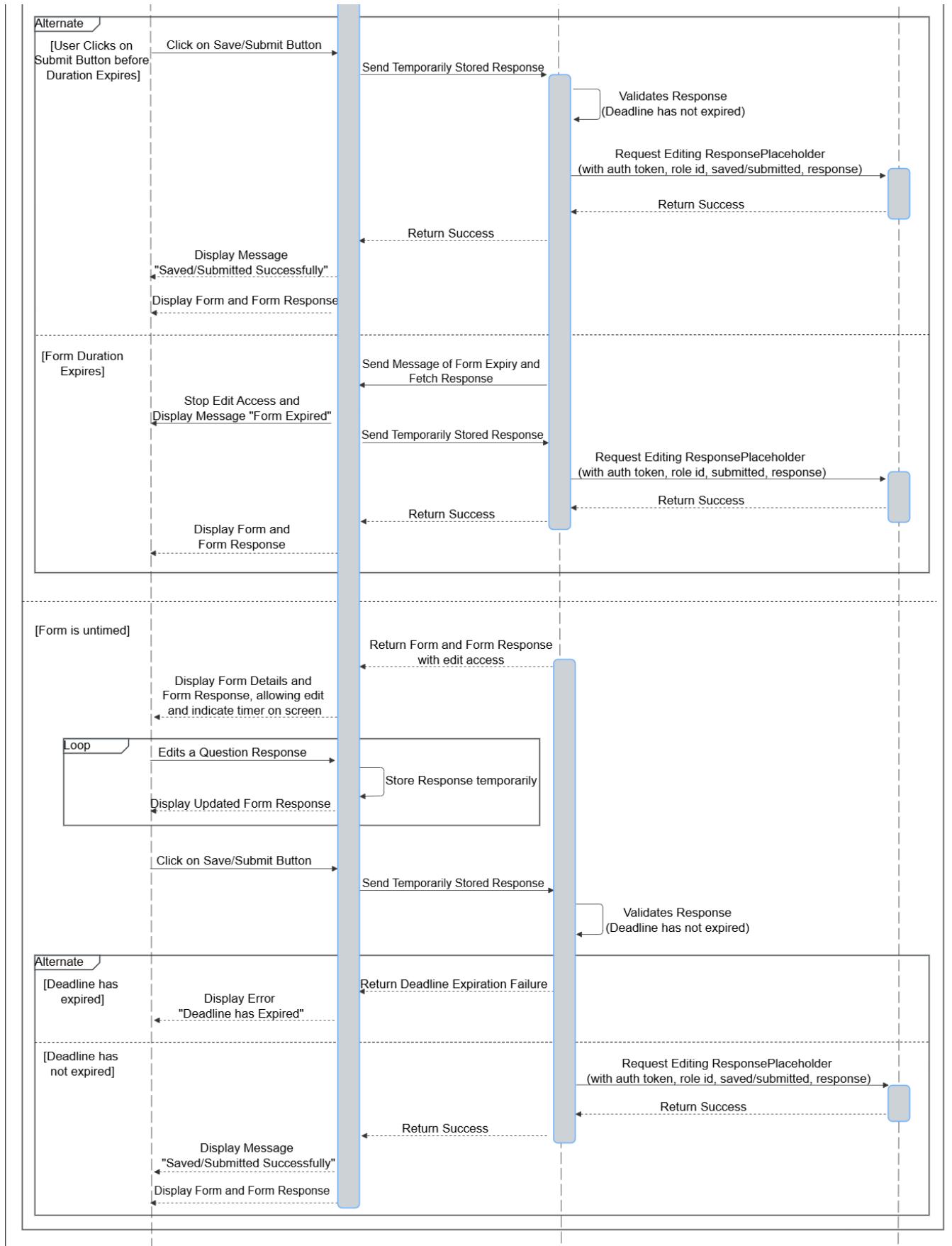


### 3.3.3 Form Creation

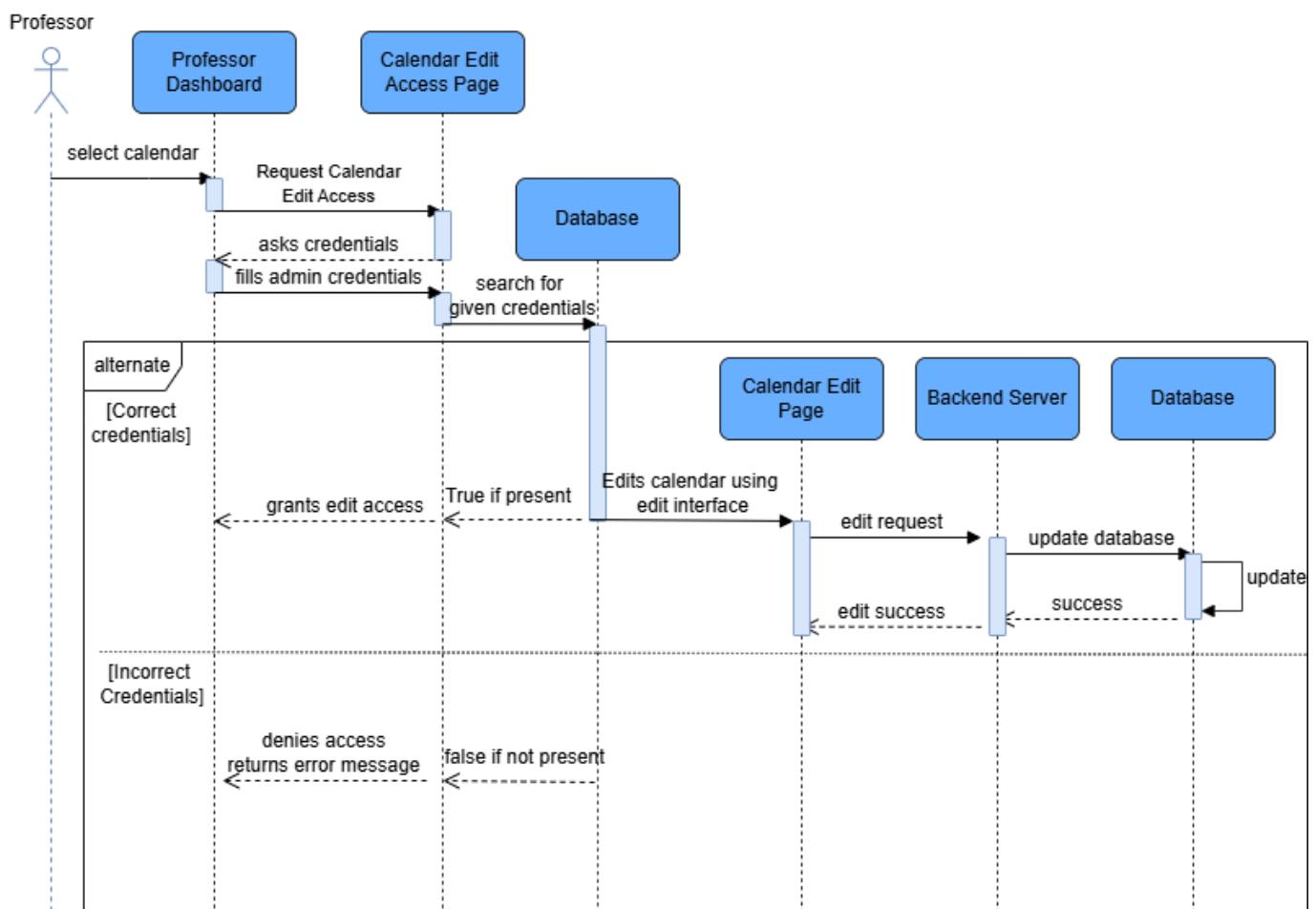


### 3.3.4 Form Filling

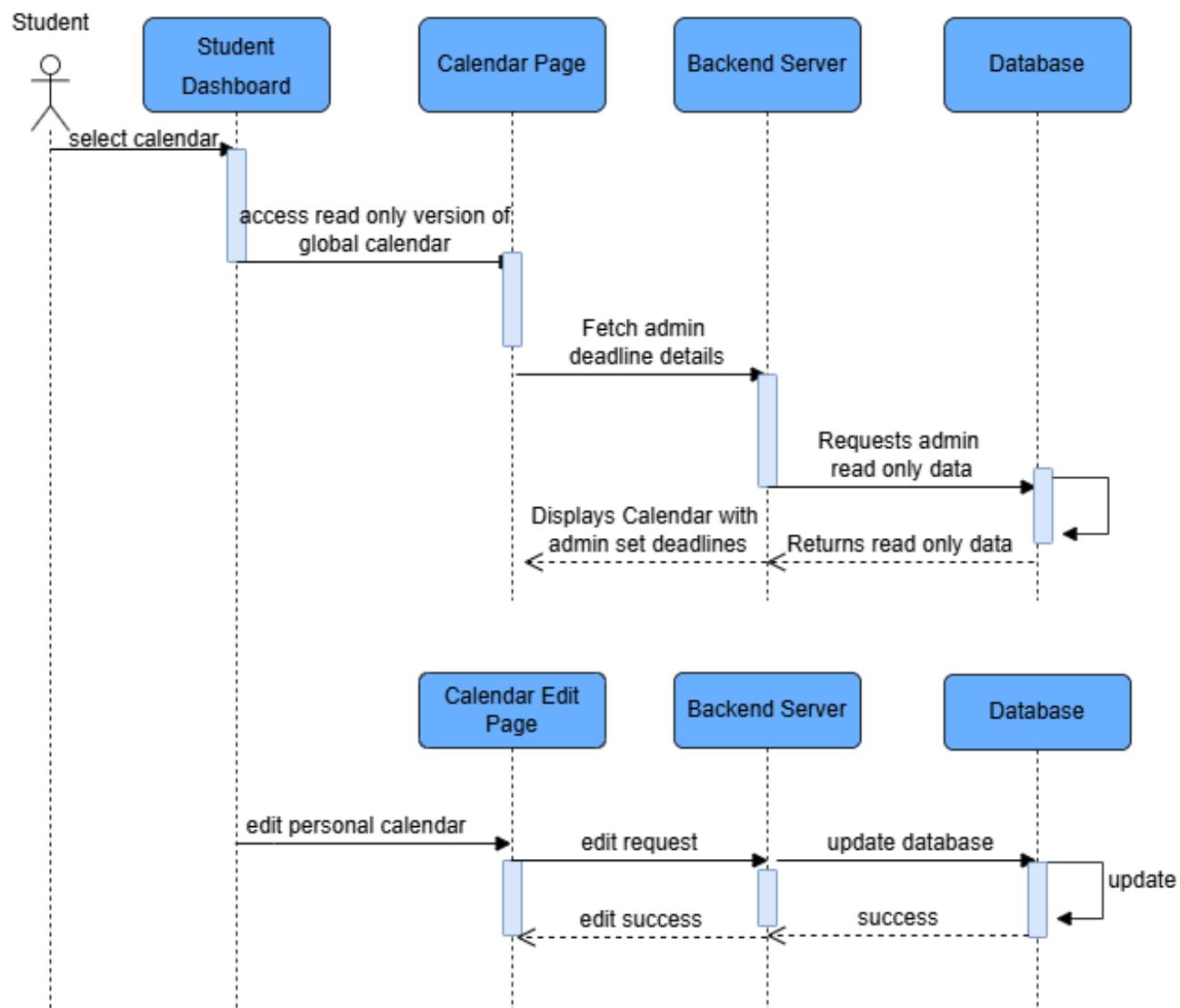




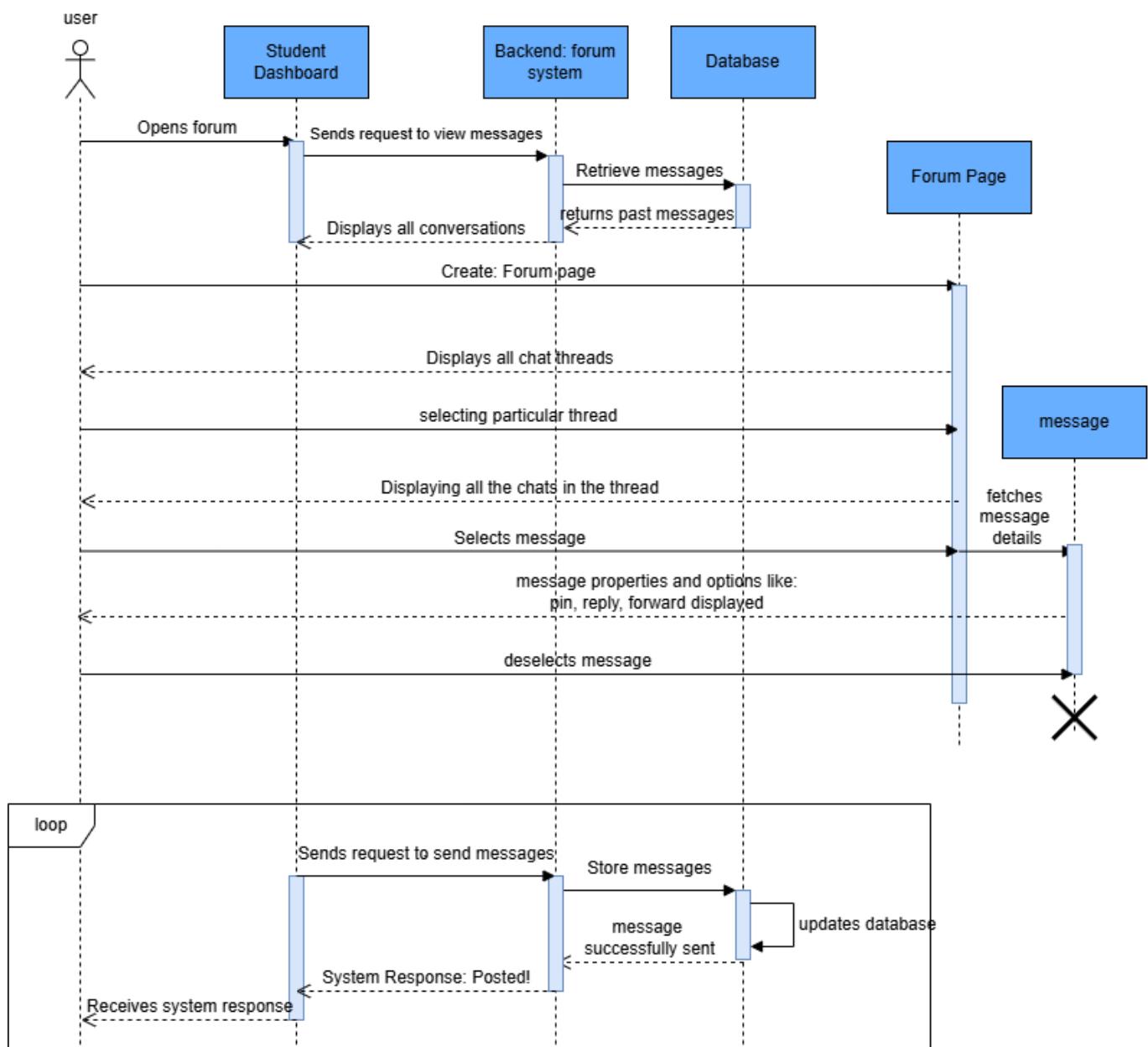
### 3.3.5 Professor Calendar



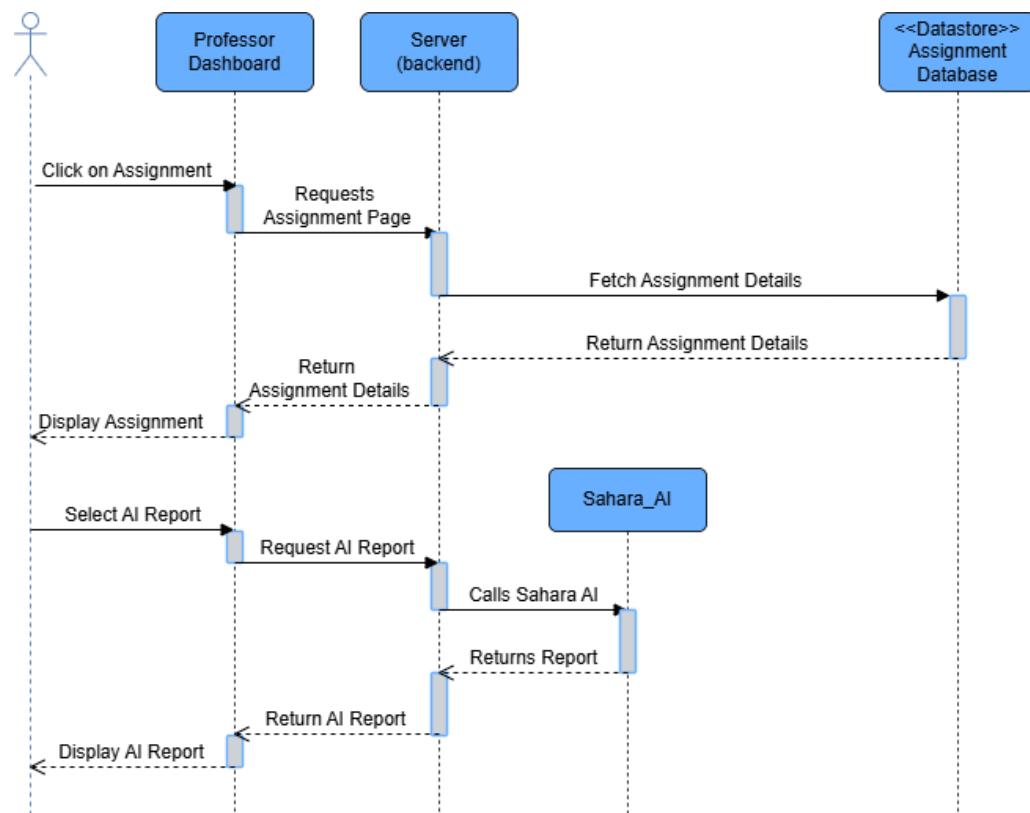
### 3.3.6 Student Calendar



### 3.3.7 Forums

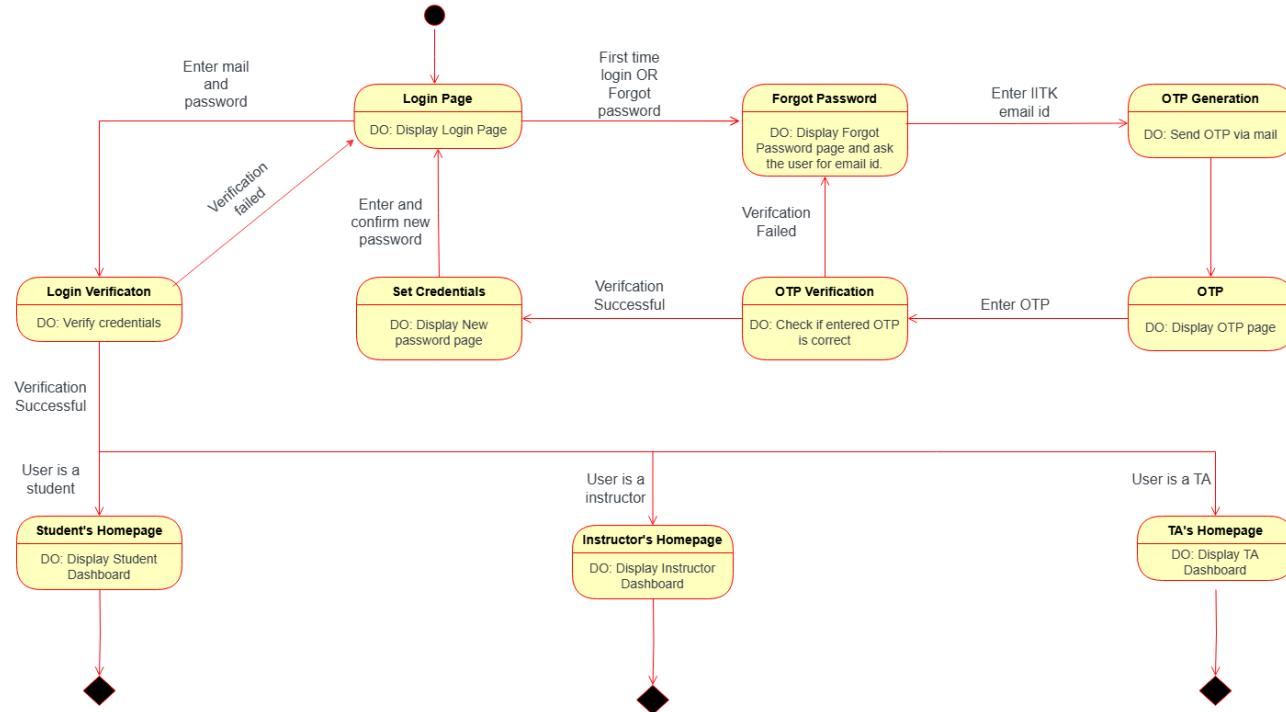


### 3.3.8 Getting Sahara AI Report

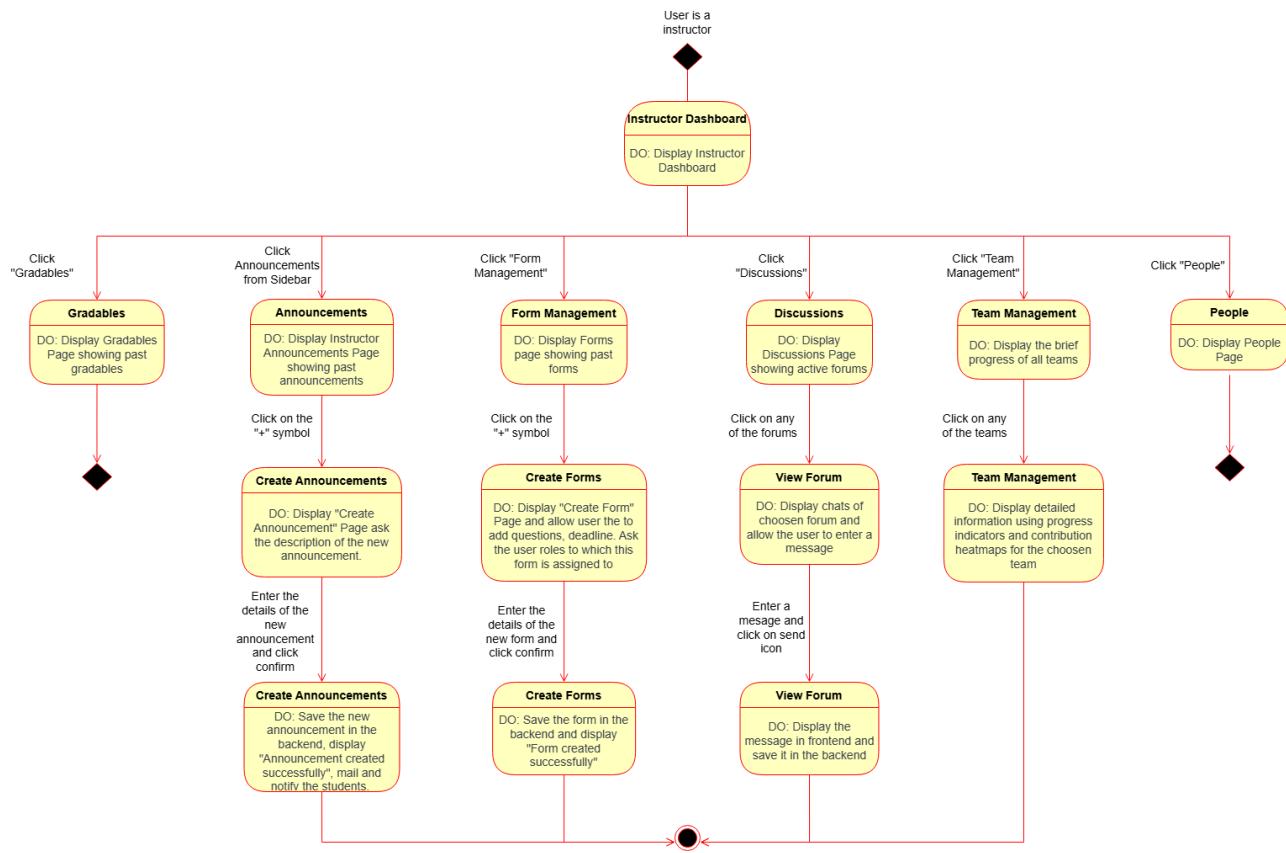


## 3.4 State Diagrams

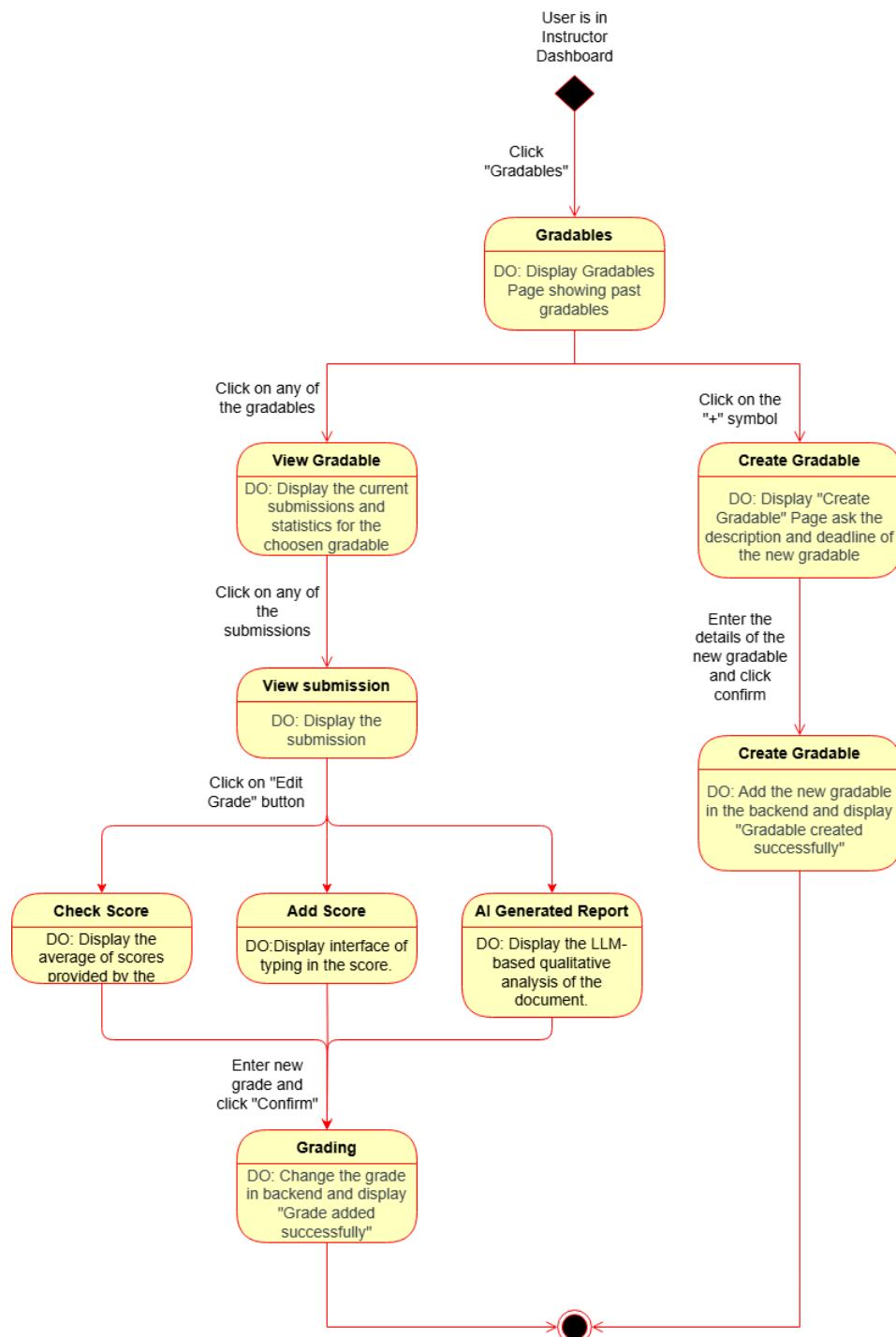
### 3.4.1 Login and Dashboard



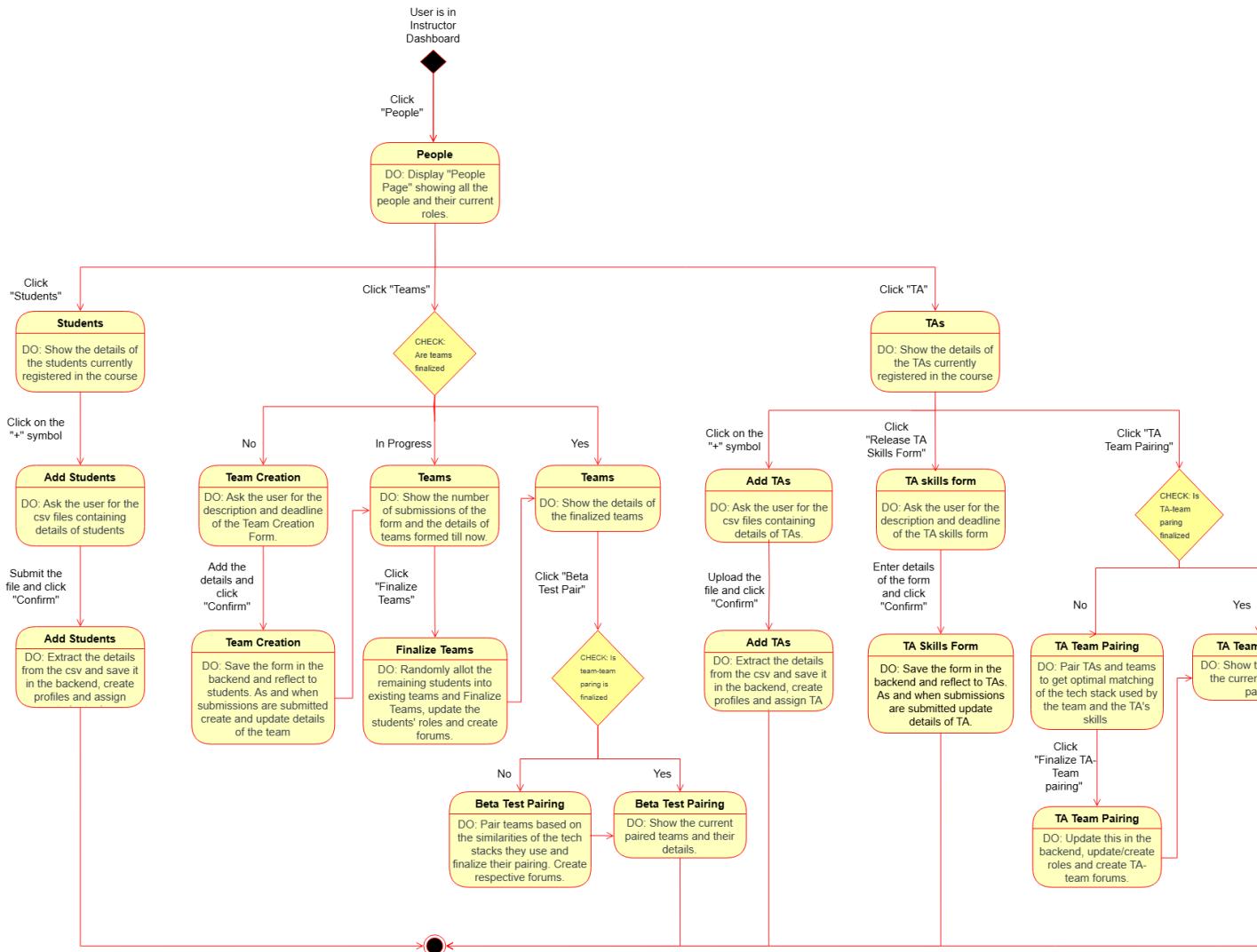
### 3.4.2 Instructor Dashboard



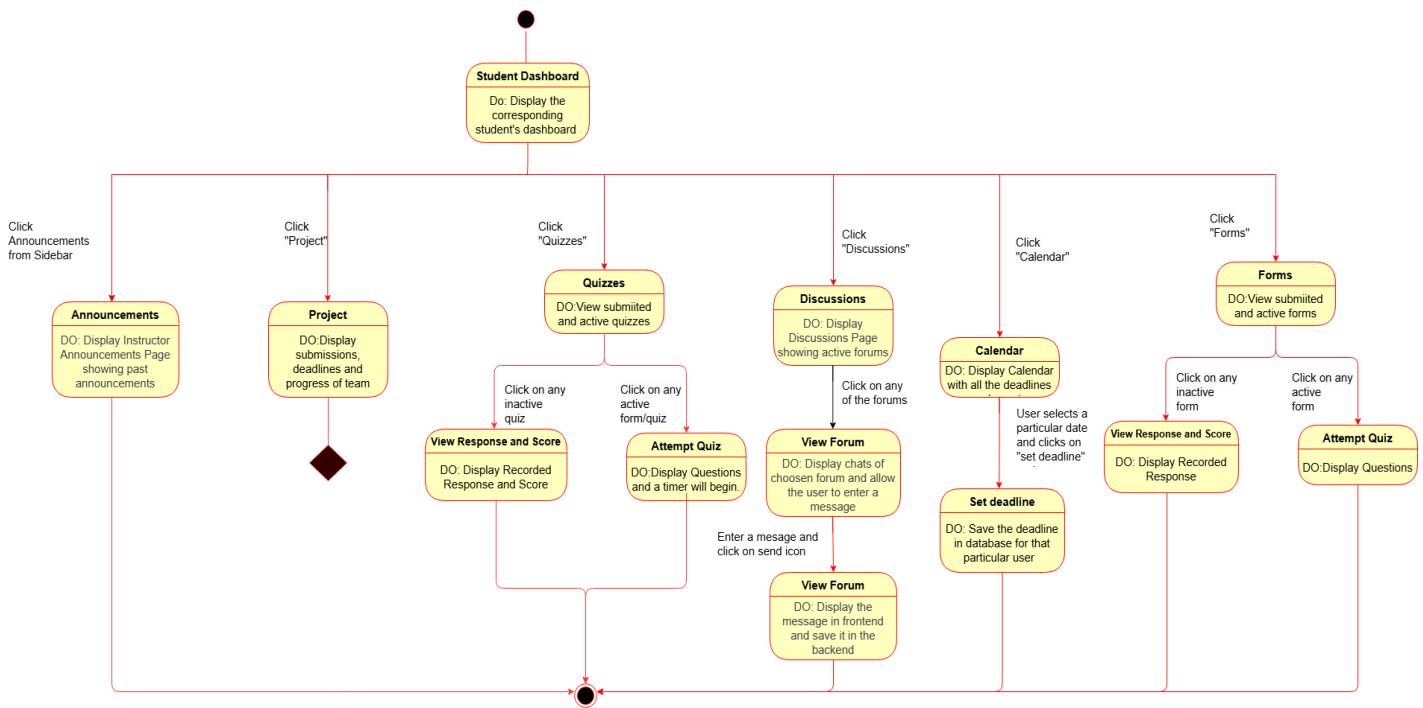
### 3.4.3 Instructor - gradables - page



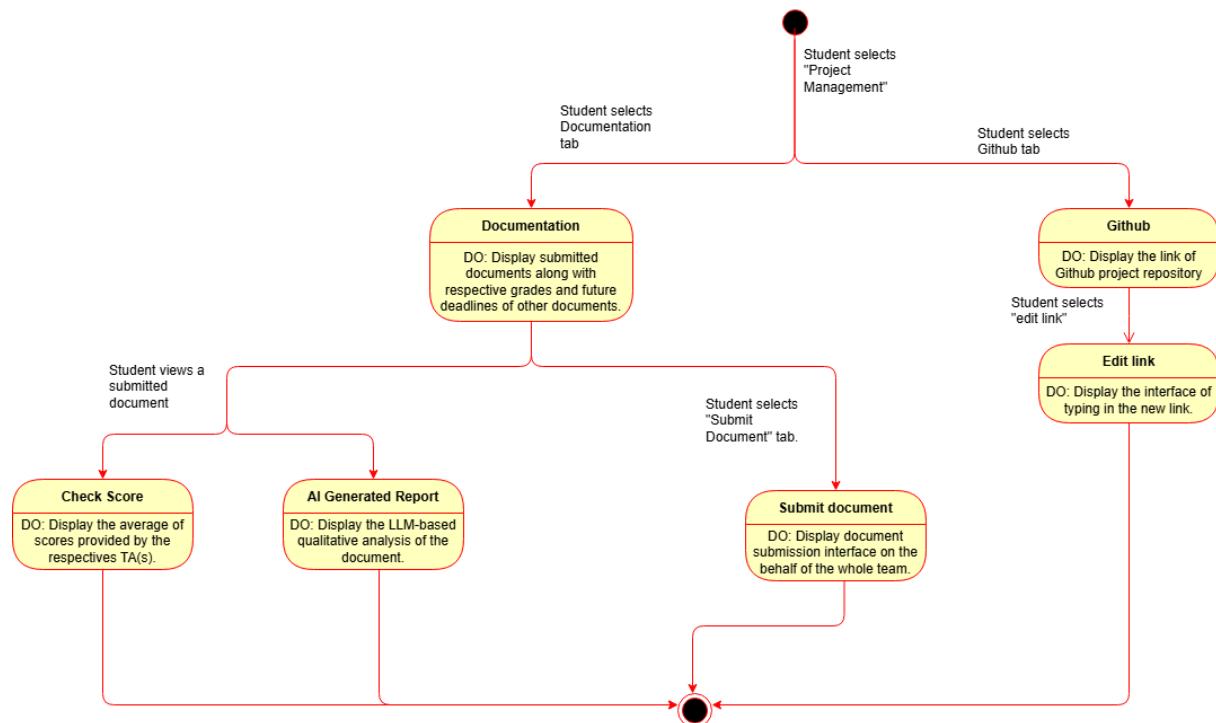
### 3.4.4 Instructor - people - page



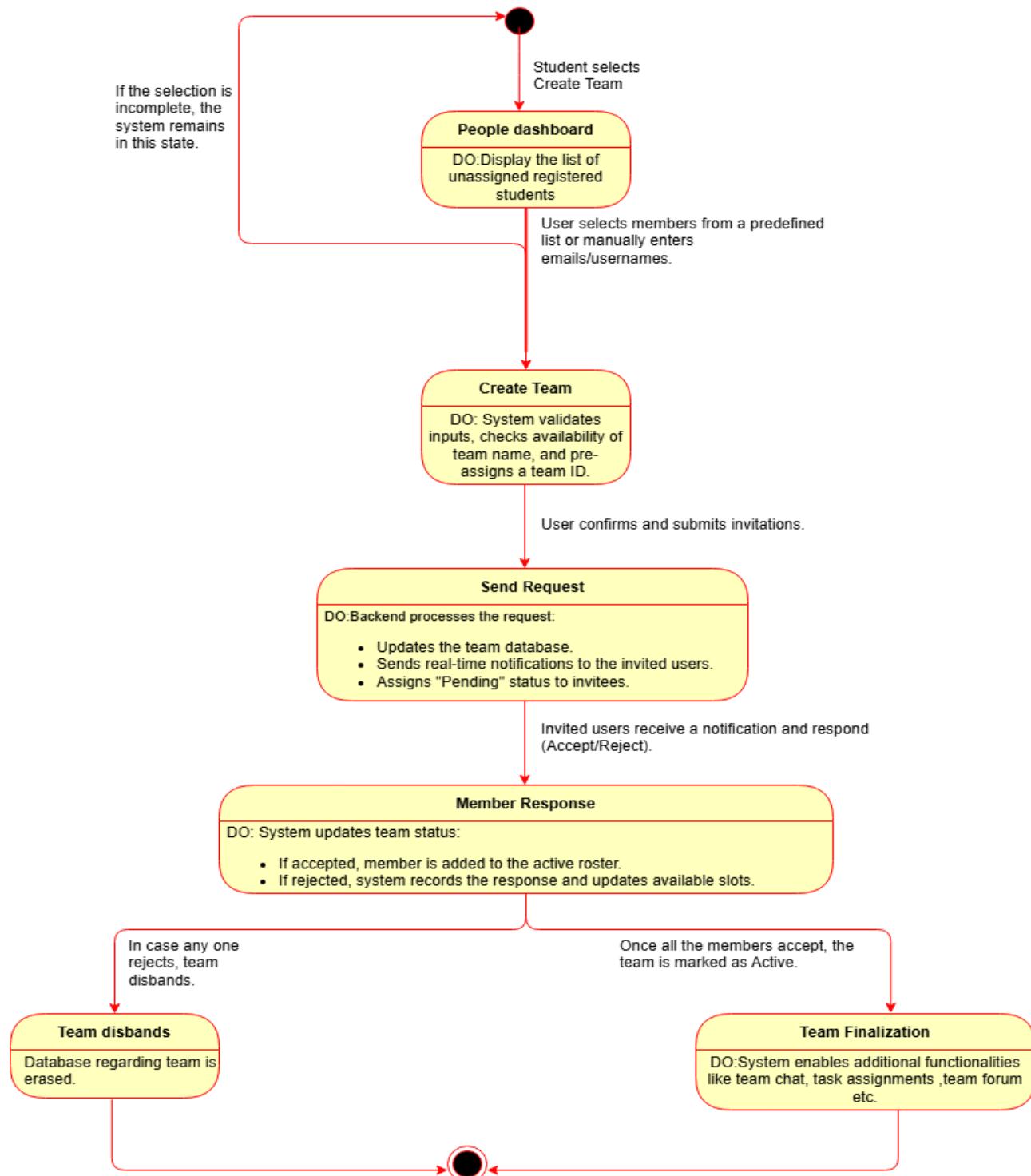
### 3.4.5 Student Dashboard



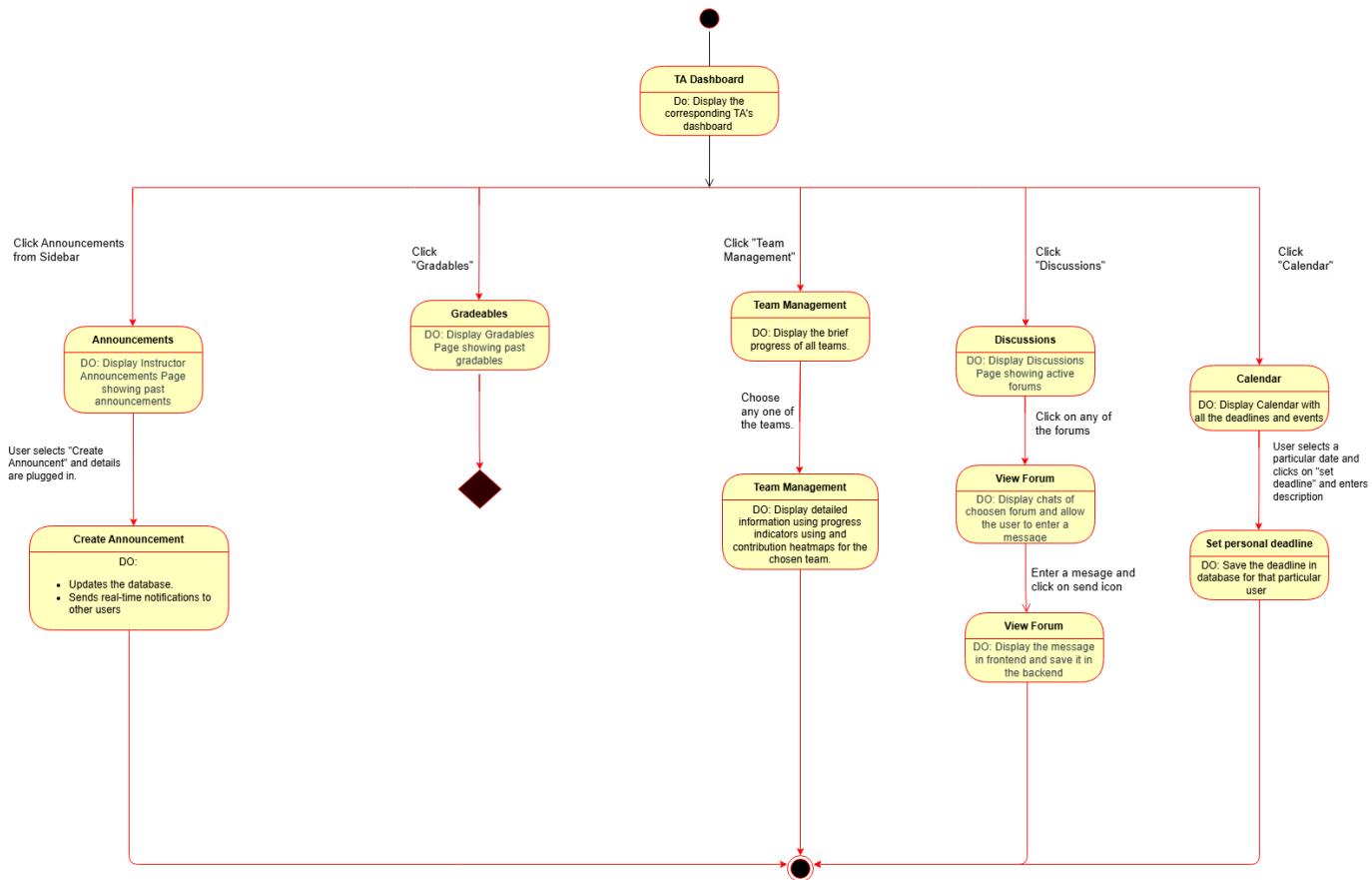
### 3.4.6 Student's Project Management



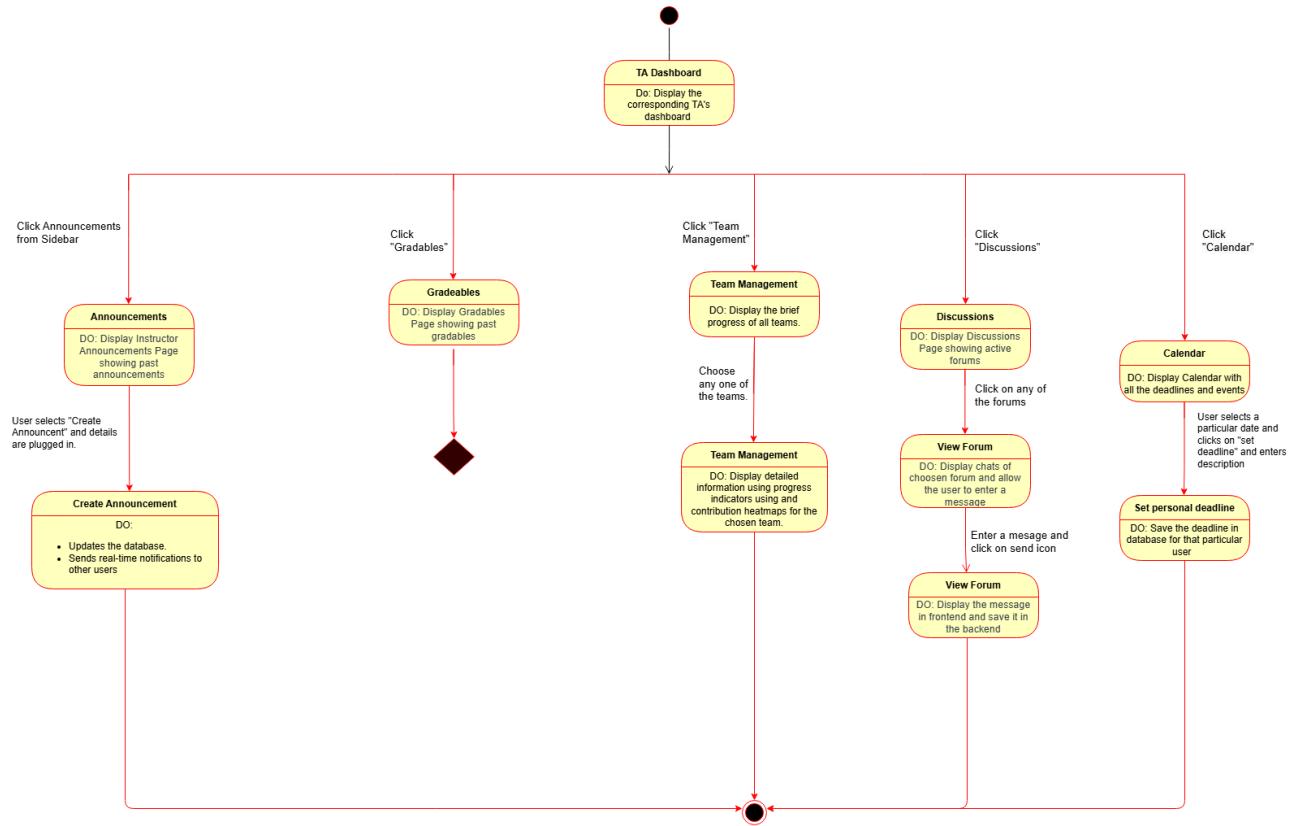
### 3.4.7 Student's Team Creation



### 3.4.8 TA Dashboard



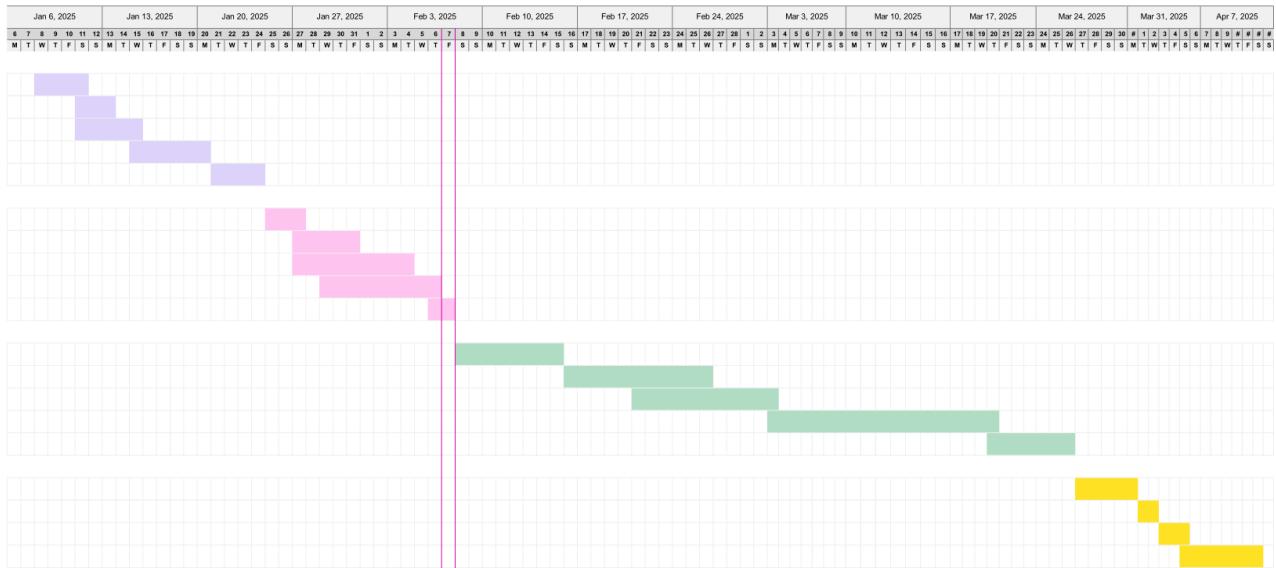
### 3.4.9 TA Gradables



## 4 Project Plan



CS253

Project start: **Wed, 1-8-2025**Display week: **1**

MEMBERS	TASK
Aarav Oswal	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT, ALPHA TESTING
Achyuth H. Warrier	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT, UNIT TESTING
Ashik Stenny	BACKEND DEVELOPMENT, CODE IMPROVEMENT, ALPHA TESTING
Divi Pothukuchi	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT, UNIT TESTING
Harshpreet Kaur	FULL STACK IMPLEMENTATION, SYSTEM TESTING, BETA TESING
Nikhil Pothuganthy	BACKEND DEVELOPMENT, INTEGRATION TESTING, ALPHA TESTING
R Charan	FRONTEND DEVELOPMENT, UNIT TESTING, ADDRESSING FEEDBACK
Ravi Arora	FRONTEND DEVELOPMENT, SYSTEM TESTING, ADDRESSING FEEDBACK
Spandan Pati	BACKEND DEVELOPMENT, INTEGRATION TESTING, CODE IMPROVEMENT
Vedhanth Balasubramanian	FRONTEND DEVELOPMENT, MANUAL FOR BETA TESTING, BETA TESTING

## Appendix A - Group Log

<Please include here all the minutes from your group meetings, your group activities, and any other relevant information that will assist in determining the effort put forth to produce this document>

Date	Timings	Duration	Minutes
25th Jan	21:00-23:30	2 hrs 30 mins	<ul style="list-style-type: none"> <li>The team developed a work breakdown structure for the design document and distributed initial tasks equitably.</li> </ul>
28th Jan	19:00-23:30	4 hrs 30 mins	<ul style="list-style-type: none"> <li>Meeting to discuss inputs received from the professor after the first design document meeting.</li> </ul>
30th Jan	20:00-23:00	3 hrs	<ul style="list-style-type: none"> <li>Discussed the initial draft on class diagrams and other object oriented design elements.</li> <li>Based on these the UI tasks were split equally among the members.</li> </ul>
2nd Feb	10:00-13:30	3 hrs 30 mins	<ul style="list-style-type: none"> <li>Initial design document draft was completed.</li> <li>Discussed over what improvements and additions were to be made to the initial draft.</li> <li>UI tasks completed were evaluated and a unified UI interface was decided.</li> </ul>
3rd Feb	21:00-2:00	5 hrs	<ul style="list-style-type: none"> <li>The team completed the intermediate draft of the project document and assigned sections to different members for cross-review and proofreading.</li> <li>The group went over each member's contribution to the document till now and it was made sure everyone made equal contributions.</li> </ul>
5th Feb	21:00-23:30	2 hrs 30 mins	<ul style="list-style-type: none"> <li>The team completed the intermediate draft of the project document and assigned</li> </ul>

			<p>sections to different members for cross-review and proofreading.</p> <ul style="list-style-type: none"><li>● Final updates to be made on the document were decided and members were assigned work.</li><li>● Final Draft was completed</li></ul>
7th Feb	20:00-23:30	3 hrs 30 mins	<ul style="list-style-type: none"><li>● The document was submitted</li></ul>