Automated Project Review and Management System

A Minor Project Report Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY IN
COMPUTER SCIENCE AND BUSINESS SYSTEMS

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CERTIFICATE

This is to certify that the project report entitled "Project Review and Management System " is a bonafide work done under our supervision and is being submitted by P Sai Kruthik Royal (22071A3245), T Sriram (22071A3254), T Bhargav (22071A3255), Y Ratna Jashwanth (22071A3262) in partial fulfillment for the award of the degree of Bachelor of Technology in Computer Science and Business Systems, of the VNRVJIET, Hyderabad during the academic year 2024-2025. Certified further that to the best of our knowledge the work presented in this thesis has not been submitted to any other University or Institute for the award of any Degree or Diploma.

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DECLARATION

We declare that the minor project work entitled "Project Review and Management System " submitted in the Department of Computer Science and Engineering, Vallurupalli Nageswara Rao Vignana Jyothi Institute of Engineering and Technology, Hyderabad, in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Business Systems is a bonafide record of our own work carried out under the supervision of Dr. V Baby , Professor, VNRVJIET. Also, we declare that the matter embodied in this thesis has not been submitted by us in full or in any part thereof for the award of any degree/diploma of any other institution or university previously.

Place: Hyderabad

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ABSTRACT

The rapid digitalization of academic institutions has significantly enhanced how students and faculty collaborate, manage coursework, and track academic progress. However, traditional systems often suffer from fragmented communication, inefficient workflows, and a lack of centralized oversight, which hampers effective project mentoring and coordination. This project addresses these systemic challenges by developing a comprehensive web-based Project Management System tailored to streamline student-faculty interactions and optimize academic project workflows. Leveraging a modern full-stack architecture—featuring React with Vite on the frontend and Node.js with Express on the backend—this platform introduces role-specific interfaces that cater to the unique responsibilities of students, faculty, and administrators. Key features include real-time notifications, structured review processes, active and archived project tracking, and a forum for collaborative discussions. Beyond functional efficiency, the system emphasizes scalability, responsive design, and role-based access control, ensuring reliable performance across diverse devices and institutional settings. By integrating state-of-the-art technologies such as Zustand for persistent state management, Firebase for real-time services, and MongoDB for robust data storage, the project reimagines academic workflow automation in a way that eliminates administrative bottlenecks and fosters continuous engagement. Ultimately, the system aspires to transform project-based learning by creating a transparent, inclusive, and efficient digital ecosystem for all users involved in academic mentoring.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

With the rising interconnection of academic communities in the present day, management, monitoring, and coordination of academic work has become crucial for academic success. With the increased use of digital technologies, educational institutions are now equipped with very powerful tools capable of streamlining administrative tasks, facilitating communication, and enhancing learning outcomes. But too many academic project management systems are still siloed, clunky, or too generic—unable to support the unique roles, workflows, and communication patterns among students, faculty, and administrators. These shortcomings frequently result in late deadlines, ineffective mentoring, and little visibility into project progress, particularly in dynamic, large-scale internship programs that demand active mentorship, timely feedback, and organized documentation.

Although some platforms have made half-hearted efforts at partial solutions—ranging from task lists to learning management systems—few of them have the integrated integrity and disciplinary-specific tailoring required for end-to-end academic project management. They tend to miss the subtleties of faculty roles as both navigators and judges, the distinctive requirements of students in charting their educational courses, and the bureaucratic weight that falls on coordinators in monitoring progress between multiple departments and timelines. Additionally, traditional systems are reactive in nature, based on static updates and manual communication, instead of facilitating proactive participation through real-time notifications, intuitive dashboards, and role-based access.

Identifying these limitations, this project presents a complete

Project Management System that is intended to automate academic processes through an intelligent, role-based, and scalable framework. Constructed with contemporary web technologies such as React with Vite for a responsive user interface, Node.js and Express for optimized backend processing, and MongoDB for horizontally scalable data storage, the

platform seeks to consolidate student-faculty-administrator interactions within a single, consistent framework. Functions like a centralized repository of projects, organized review cycles, real-time alerts, and discussion forums are integrated into the very core of the system so that academic mentoring is freed from administrative bottlenecks and delays in communication. Instead of imposing a uniform model, the platform is designed to be responsive, conforming to institutional processes while being flexible enough to scale and adapt. Through this integrated strategy, the system not only promotes improved project results but also transforms the way mentoring, evaluation, and scholarly collaboration are performed in today's digital age.

1.2 Objectives

The primary objectives of a computer accessibility system are :

1. To develop a multimodal input system combining eye tracking and voice commands for accessible computing.
2. To utilize open-source eye-tracking software for cursor movement and basic interactions.
3. To implement voice commands to handle tasks not feasible through gaze control, such as typing and executing keyboard inputs.
4. To create a natural language processing (NLP) layer that interprets flexible, natural user speech into executable system commands.
5. To design a lightweight, adaptable architecture suitable for users with varying types and degrees of motor impairments.
6. To demonstrate a working integration of gaze control, speech input, and natural language parsing for a seamless user experience.

CHAPTER 2

LITERATURE SURVEY

2.1 Literature Review

[1] S. S. N. Challapalli et al. (2021) This study compares web development technologies, specifically Node.js and Python, focusing on performance metrics such as response time and scalability. The authors conclude that Node.js offers superior performance for real-time applications, making it a suitable choice for developing responsive web applications. This insight supports the selection of Node.js in your MERN stack-based project review system, ensuring efficient handling of concurrent user interactions.

[2] M. Patel and A. Gupta (2023) The authors present a College ERP system developed using the MERN stack, aiming to streamline project tracking and management within educational institutions. The system facilitates real-time monitoring and enhances communication between students and faculty. This work provides a practical example of implementing MERN stack in academic settings, offering valuable architectural insights for your project.

[3] A. Smith (2022) This paper explores the integration of geospatial data into eLearning platforms to enhance educational content delivery. By incorporating location-based data, the study demonstrates improved contextual learning experiences. While not directly related to project review systems, the approach highlights the potential of enriching educational platforms with additional data layers, which could be considered for future enhancements.

[4] L. Brown and R. Kumar (2023) The study examines the use of Moodle and WhatsApp to enhance collaborative learning among students. It finds that combining formal learning management systems with informal communication tools fosters better engagement and collaboration. This suggests that integrating similar communication features into your project review system could improve user interaction and feedback.

[5] R. Johnson (2022) This paper discusses security enhancements in web applications using JSON Web Tokens (JWT), Role-Based Access Control (RBAC), and encryption techniques. The

proposed methods ensure secure authentication and authorization processes. Implementing these security measures in your system would protect sensitive project data and user information.

[6] C. White (2023) The author investigates the benefits of Progressive Web Applications (PWAs) for monitoring systems, emphasizing their offline capabilities and improved user experience. PWAs combine the best features of web and mobile applications. Adopting PWA principles in your project review system could enhance accessibility and usability across various devices.

[7] A. Williams and P. Nelson (2021) This study focuses on implementing Role-Based Access Control (RBAC) in educational platforms to manage user permissions effectively. RBAC ensures that users access only the information pertinent to their roles. Incorporating RBAC into your system would enhance security and streamline user interactions.

[8] J. Carter (2023) The paper presents a cloud-based project management system tailored for university settings, facilitating collaboration and resource sharing. The system's scalability and accessibility make it suitable for academic environments. This aligns with your project's objectives, offering insights into cloud integration for efficient project management.

[9] K. Brown and S. Jones (2023) The authors develop a web-based student feedback system for universities, enabling real-time collection and analysis of student evaluations. The system improves feedback accuracy and responsiveness. Incorporating similar feedback mechanisms into your project review system could enhance continuous improvement processes.

[10] A. Williams and T. Johnson (2023) This study introduces a web-based project tracking system for academic institutions, focusing on transparency and accountability in project management. The system allows stakeholders to monitor progress and milestones effectively. Adopting such tracking features in your system would facilitate better oversight and coordination.

[11] R. Patel and M. Gupta (2022) The paper discusses the implementation of Role-Based Access Control (RBAC) in secure project management systems, emphasizing the importance of access restrictions based on user roles. This approach ensures data confidentiality and integrity. Applying RBAC in your system would strengthen security protocols.

[12] S. White (2023) The author explores secure authentication methods in web-based educational platforms using JWT. The study highlights JWT's efficiency in managing user sessions and preventing unauthorized access. Integrating JWT into your system would enhance authentication processes and user trust.

[13] L. Brown and K. Smith (2023) This paper examines cloud-based storage solutions for academic project management, focusing on data accessibility and collaboration. The study underscores the benefits of cloud integration in educational settings. Incorporating cloud storage in your system would facilitate seamless data sharing and backup.

[14] P. Nelson and A. Wright (2023) The authors detail the implementation of a MERN stack-based ERP system for universities, highlighting its modularity and scalability. The system streamlines administrative processes and data management. This reinforces the suitability of the MERN stack for your project, offering a robust framework for development.

[15] J. Carter and D. Lopez (2023) This study presents a web-based project review system featuring real-time notifications and alerts to keep users informed about project updates. The system enhances communication and responsiveness. Incorporating similar notification features in your system would improve user engagement and awareness.

[16] B. Zhang and Y. Lee (2022) The paper discusses integrating version control systems into web-based academic platforms, facilitating collaborative development and tracking changes. Version control enhances transparency and accountability. Implementing such features in your system would support collaborative project work and historical tracking.

[17] C. White and R. Kumar (2023) The authors explore the application of Progressive Web Applications (PWAs) in educational project management, focusing on offline access and cross-platform compatibility. PWAs offer a seamless user experience. Adopting PWA technologies in your system would enhance accessibility for users across different devices and connectivity conditions.

[18] M. Patel and S. Khan (2022) This study investigates methods to enhance user experience in web-based project review systems, emphasizing intuitive design and user-friendly interfaces. Improved UX leads to higher user satisfaction and efficiency. Applying these principles to your system would make it more accessible and effective for users.

[19] A. Williams (2023) The paper examines the use of blockchain technology for academic credential verification and project authentication, ensuring data immutability and security. Blockchain provides a tamper-proof record of academic achievements. Integrating blockchain into your system could enhance the credibility and verification of project submissions.

[20] T. Brown and S. Garcia (2023) This study focuses on database optimization strategies for scalable project management systems, addressing performance bottlenecks and data handling efficiency. Optimized databases support system scalability and responsiveness. Implementing these strategies in your system would ensure it can handle increasing data loads effectively.

[21] H. Wang (2022) The author presents a web-based peer review system for student project evaluation, promoting collaborative assessment and feedback. The system encourages critical thinking and peer learning. Incorporating peer review functionalities into your system would foster a collaborative learning environment.

[22] P. Taylor and R. Lewis (2023) This paper discusses data privacy and security considerations in educational web applications, highlighting compliance with regulations and user trust. Ensuring data protection is crucial in academic systems. Applying these considerations to your system would safeguard user information and maintain compliance.

[23] N. Wilson and K. Roberts (2023) The authors detail the implementation of RESTful APIs in MERN-based project review systems, facilitating modularity and integration with other services. RESTful APIs enable efficient communication between system components. Incorporating RESTful APIs into your system would enhance its extensibility and interoperability.

[24] D. Smith and L. Johnson (2023) This study explores digital signature implementation for secure project submissions, ensuring authenticity and non-repudiation. Digital signatures protect against unauthorized alterations. Integrating digital signature functionalities into your system would enhance the security and integrity of project submissions.

2.2 Existing System

Current project management and assessment systems in academic environments, such as traditional documentation methods, basic project tracking tools, and generic learning management software, provide limited functionalities for the monitoring and management of project assessments. Such systems often rely on manual record keeping, spreadsheet tracking, and face-to-face meetings, resulting in poor communication, inconsistent documentation quality, and lack of insight into project progression. Without the use of specialized equipment intended for the academic project review process, stakeholders are hindered in collaboration, feedback provision, and maintenance of historical records.

2.3 Drawbacks of Existing System

- **Manual Burden of Tracking:** Current systems require manual tracking of project assessments and feedback using spreadsheets or physical documents, creating heavy administrative loads for teachers and increasing the risk of information loss or documentation discrepancy.
- **Unconnected Communication:** Without a centralized platform, communication between students, guides, and in-charges takes place through disparate means (like email, messaging apps, and face-to-face meetings), leading to the development of information silos, miscommunication, and difficulty in tracking project history.
- **Lack of Real-time Collaboration:** Traditional systems do not support real-time collaboration on project evaluations, forcing users to schedule separate meetings and manually collect feedback, thus extending the iteration process and reducing productivity.
- **Inefficient Handling of Past Projects:** Existing projects and their respective evaluations are often stored unevenly or made inaccessible once they have been completed, preventing effective knowledge transfer between academic cycles and limiting plagiarism detection opportunities or referencing earlier work.
- **Limited Reporting Capabilities:** Academic administrators are hindered in generating detailed reports on project progress, participation, and outcomes across various classes, years, or departments due to the lack of integrated analytics and reporting features.

- **Inconsistent Access Control:** Role-based permission-less tools create challenges in providing appropriate levels of access to different stakeholders, potentially resulting in exposure of confidential data or denial of critical access to project-related information.

CHAPTER 3

Proposed System

3.1 Frontend Components

3.1.1 Core Application Structure

The frontend application is built using React.js, with a well-organized structure that includes:

Main Application Entry Point (App.jsx): Serves as the root component that initializes the application, sets up routing, and manages the overall application state.

Routing System: Implements client-side routing using React Router, enabling navigation between different views and components without page reloads.

State Management: Utilizes Redux for centralized state management, allowing components to access and modify application state predictably.

3.1.2 User Interface Components

The UI is organized into several key areas:

Pages Module: Contains different views of the application, each representing a major section or feature.

Reusable Components: A library of common UI elements (buttons, forms, cards, etc.) that maintain consistency across the application.

Image Assets: Organized collection of visual assets used throughout the application, optimized for web delivery.

3.1.3 Application Services

The service layer handles:

API Communication: Manages all interactions with the backend through well-defined service interfaces.

Utility Functions: Common helper functions for data manipulation, formatting, and validation.

Library Integrations: Third-party library implementations for enhanced functionality.

3.2 Backend Services

The backend provides:

API Endpoints: RESTful endpoints for data operations, authentication, and business processes.

Business Logic: Core application logic that processes requests and manages data flow.

Data Processing: Services for data transformation, validation, and business rule enforcement.

3.3 System Features

3.3.1 User Management

Comprehensive user management system including:

Authentication: Secure login and registration processes with token-based authentication.

User Profiles: Complete user profile management with personal information and preferences.

Access Control: Role-based access control (RBAC) for different user types and permissions.

3.3.2 Data Management

Robust data handling capabilities:

Data Storage: Efficient storage and retrieval of application data.

Data Validation: Input validation and sanitization to ensure data integrity.

Error Handling: Comprehensive error handling and logging system.

3.3.3 Application Functionality

Core application features:

Business Processes: Implementation of main business workflows and processes.

Feature Modules: Modular implementation of different application features.

Integration Points: Well-defined interfaces for system integration.

3.4 Technical Specifications

3.4.1 Frontend Technologies

Modern frontend stack:

React.js: Component-based UI development with virtual DOM for efficient rendering.

CSS Styling: Modular CSS with support for responsive design and theming.

State Management: Redux for predictable state management and data flow.

3.4.2 Backend Technologies

Robust backend infrastructure:

Server Framework: High-performance server framework for handling requests.

Database System: Relational database for structured data storage.

API Architecture: RESTful API design with proper versioning and documentation.

3.4.3 Development Tools

Comprehensive development environment:

Version Control: Git for source code management and collaboration.

Build Tools: Modern build system for code compilation and optimization.

Development Environment: Local development setup with hot-reloading and debugging tools.

3.5 System Integration

Seamless system integration:

Frontend-Backend Communication: HTTP/HTTPS protocols for secure data exchange.

API Integration: Standardized API endpoints with proper documentation.

Data Flow Management: Efficient data flow between frontend and backend components.

3.6 Security Features

Comprehensive security measures:

Authentication Mechanisms: Secure user authentication with password hashing and token management.

Data Protection: Encryption of sensitive data and secure transmission protocols.

Access Control Systems: Granular permission management and role-based access.

3.7 Performance Considerations

Optimized system performance:

Frontend Optimization: Code splitting, lazy loading, and asset optimization.

Backend Performance: Caching strategies and query optimization.

Database Optimization: Indexing, query optimization, and connection pooling.

Each component of the system is designed to work together seamlessly, providing a robust, secure, and high-performance application that meets the business requirements while maintaining scalability and maintainability.

CHAPTER 4

SOFTWARE REQUIREMENT ANALYSIS

4.1 INTRODUCTION

Following requirement elicitation, requirement analysis becomes a critical phase in the system development lifecycle. It ensures that gathered requirements are rigorously evaluated, refined, and organized to remove ambiguities and establish a shared understanding of system expectations. This process leads to the formulation of clear, traceable, and actionable system requirements that serve as a blueprint for implementation. Additionally, this phase includes the use of diagrams and models to represent system behavior, interactions, and architecture, providing a detailed visualization of the overall structure. In the case of the **Project Management System**, requirement analysis focuses on mapping the unique workflows of students, faculty, and administrators into a role-driven, secure, and scalable application. The system integrates task tracking, project reviews, appointment scheduling, and real-time notifications to improve project coordination and academic outcomes across departments.

4.1.1 PURPOSE OF DOCUMENT

This document presents a detailed plan for the development of the **Project Management System**, which aims to streamline academic project supervision, submission, and evaluation through a centralized digital platform. The primary audience includes current and future developers, academic coordinators, faculty members, and system administrators involved in the project lifecycle.

It outlines the core functionalities and architectural blueprint of the system, defines its scope, presents system models like use case diagrams and data flow diagrams, and describes both functional and non-functional requirements. This document also includes a discussion on project risks, development methodology (such as Agile or iterative development), and performance metrics to be tracked. By consolidating these elements, it ensures that the project team shares a unified understanding of the system's vision, goals, and deliverables.

4.1.2 DEFINITIONS

- **Project Management System**

  A role-based, web-enabled platform designed to manage the lifecycle of academic projects—from team formation to final evaluation. The system supports student-faculty coordination, project tracking, review management, and institutional reporting.

- **Student Workboard**

  A dynamic interface that enables students to create, update, and monitor project tasks. Tasks progress through defined stages: *To-Do → In Progress → Done → Approved*, with real-time updates and faculty visibility.

- **Review Management**

  A feature that supports structured review workflows, where project reviews are conducted at different stages (e.g., Abstract, Design, Final). Faculty guides and incharges evaluate progress, provide feedback, and assign scores.

- **Role-Based Access Control (RBAC)**

  A security model that limits user access and privileges based on roles (Admin, Faculty, Student). It ensures data privacy and workflow segmentation across users.

- **Appointment Module**

  A component that allows students to view faculty availability and book appointments. Faculty members can upload timetables and manually adjust their availability status.

- **Project Forum**

  A collaboration space where faculty can post new project ideas by domain. Students can browse opportunities and express interest in projects aligned with their academic goals.

- **Admin Dashboard**

  A control panel for institutional administrators to manage users (create, update, delete accounts), monitor system usage, and oversee project distribution and compliance.

- **Tech Stack**

  The core technologies used include **React (Vite)** and **Tailwind CSS** for the frontend, **Node.js + Express** for the backend, and **MongoDB** for the database. Authentication is handled through protected routes and session tokens.

4.2 SYSTEM ARCHITECTURE

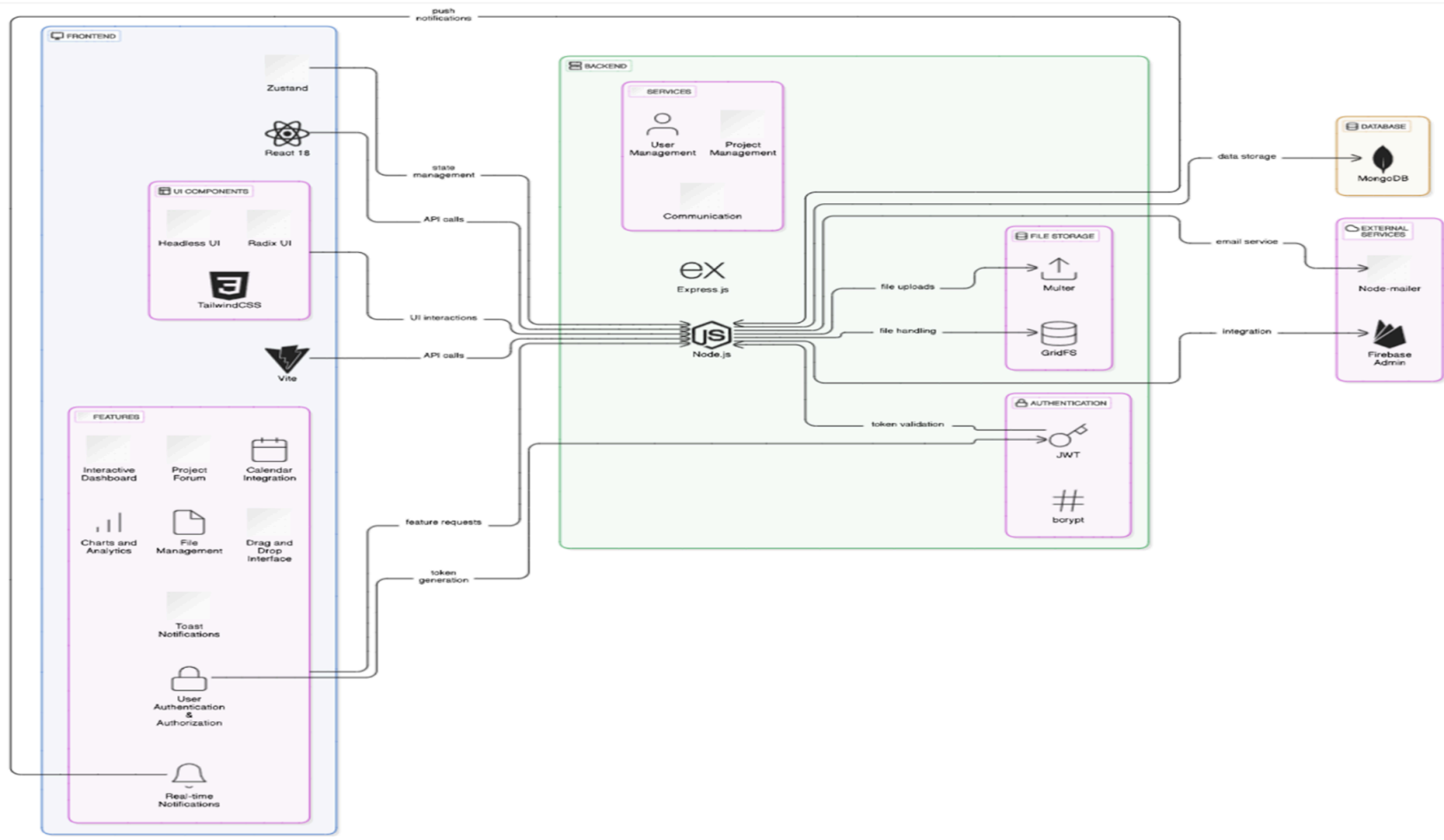

Figure 4.1: System Architecture

4.3 FUNCTIONAL REQUIREMENTS

Functional requirements describe the specific behavior and features the system must exhibit to meet user and business needs. These requirements form the foundation for system functionality and outline what the system *shall do* in response to user inputs or internal processes. For the **Project Management System** , functional requirements are categorized based on the roles: **Admin**, **Faculty (Guide/Incharge)**, and **Student**. Each role has access to a tailored interface and capabilities aligned with their responsibilities in the academic project lifecycle.

4.3.1 ADMIN FUNCTIONALITIES

- **User Management**
  - Add, update, or delete student, faculty, and admin user accounts.
  - Assign roles and sections to new users upon creation.

- **Project Oversight**
  - Monitor project assignments across branches, years, and semesters.
  - View all ongoing and archived projects.
  - Generate project reports for academic review or audits.

- **System Configuration**
  - Manage academic timelines (start/end dates for reviews).
  - Set access privileges and default system settings.

4.3.2 FACULTY FUNCTIONALITIES

- **Profile Management**
  - View and edit personal academic and contact information.

- **Project Supervision (Guide Role)**
  - View assigned teams and their project details.
  - Create and assign tasks to teams via the **Workboard**.
  - Monitor task progress through real-time status updates.
  - Evaluate student submissions and provide feedback.
  - Enter review scores and remarks for each phase (e.g., Abstract, Literature, Final).

- **Review Management (Incharge Role)**
  - Access all teams under the assigned class or section.
  - Conduct physical reviews and record scores, comments, and satisfaction levels.

- Validate review submissions made by students and guides.

- **Project Forum**
  - Post new project ideas (Title, Domain, Description).
  - View interest from students.
  - Browse and view projects posted by other faculty.

4.3.3 STUDENT FUNCTIONALITIES

- **Profile Management**
  - View and update academic and contact information.

- **Project Participation**
  - View assigned project and guide details.
  - Collaborate with teammates on shared tasks.
  - Access past projects and plagiarism checks.

- **Workboard Management**
  - View tasks assigned by guide.
  - Update task status (To-Do → In Progress → Done → Approved).
  - Add comments or remarks when updating tasks.

- **Review Tracking**
  - View review stages and submission deadlines.
  - Submit phase deliverables as required (e.g., Abstract, Design).
  - Receive scores and feedback from guide/incharge

4.3.4 SYSTEM-WIDE FUNCTIONALITIES

- **Authentication and Authorization**
  - Secure login for all users with role-based access.

- Session management and logout functionality.

- **Notification System**
  - Notify students when tasks are assigned.
  - Alert guides when students update task status.
  - Notify students about review feedback and appointment status.

- **Search and Filter**
  - Search for users, projects, or appointments based on filters (e.g., branch, year, domain).

- **Dashboard and Analytics**
  - Visualize project progress, pending reviews, and task completions.
  - Provide usage insights for admin and faculty roles.

4.4 SYSTEM ANALYSIS

(To be added as a diagram of modular components: Student Panel, Faculty Panel, Admin Dashboard → Project Modules → Notifications, Reviews, Tasks, Forum)

4.4.1 Analysis

The system was developed after analyzing the inefficiencies in current academic project workflows. We studied traditional mentoring methods and existing digital tools, identifying major gaps such as lack of structured progress tracking, poor communication flow, and minimal automation. These limitations often led to missed deadlines, limited feedback loops, and administrative overhead.

● Solution Requirement

Following feasibility analysis and stakeholder interviews, a modular project management solution was envisioned. The essential requirements were extracted to ensure streamlined interaction between students, guides, and incharges. Key features included role-based access, structured review scheduling, active task boards, project archiving, notification triggers, and a dedicated project discussion forum.

- **Solution Constraints**

Constraints included ensuring performance consistency across devices, secure access control for different user types, and managing real-time communication without latency. Browser compatibility, authentication security, and handling concurrent updates were other challenges tackled using scalable backend services, optimized database queries, and efficient frontend state management.

4.4.2 Design

We adopted a modular architecture using a full-stack approach to support scalability and code maintainability. The system consists of:

- **Frontend:** Built with **React + Vite**, providing responsive UI with TailwindCSS
- **Backend:** Developed using **Node.js with Express**, offering RESTful APIs.
- **Database:** MongoDB for structured storage of users, projects, reviews, and logs.
- **Authentication:** Firebase for secure login, notifications, and session tracking.
- **State Management:** Zustand used to persist and share state across components.
- **User Roles:**
  - **Students** view assigned projects, update workboards, and receive review scores.
  - **Faculty** guide project progress, assign tasks, and review team performance.
  - **Admins** manage user accounts and system-wide data integrity.

4.4.3 Development

Development followed an agile methodology with weekly sprints and iterative feature testing.

- **Frontend** used Vite + React, with TypeScript for type safety and component reusability.
- **Backend** APIs were tested using Postman and handled token-based authentication with Firebase.
- **Notifications** were implemented using Firebase Cloud Messaging.
- **Project Tasks and Reviews** were managed via JSON-based review models and RESTful endpoints.
- Version control was maintained using Git with GitHub. Development and testing were conducted in Visual Studio Code.

4.4.4 Evaluation

The system was tested across student teams and faculty volunteers. Functional testing focused on task assignment flows, review table updates, and real-time notification responses. Performance was evaluated on:

- Page load times,
- Data sync consistency,
- Access control checks.

Feedback from testers was used to refine UI components, reduce form complexity, and improve usability across roles.

4.5 NON-FUNCTIONAL REQUIREMENTS

4.5.1 Performance Requirement

- Response time should not exceed 300ms for dashboard actions.
- The system should support 100+ concurrent users across different roles.
- Backend API latency must be under 150ms in standard load conditions.

4.5.2 Safety Requirement

- Input validation and form sanitization must prevent accidental data overwrites.
- Review submissions require confirmation and cannot be edited once locked.
- Admin-level changes are logged and restricted to verified accounts.

4.5.3 Security Requirement

- Firebase Authentication ensures secure, token-based login sessions.
- All sensitive data (user info, project logs) is encrypted in transit via HTTPS.
- Role-based access control prevents unauthorized data manipulation.

4.6 SOFTWARE REQUIREMENT SPECIFICATION

4.6.1 VISUAL STUDIO CODE

Visual Studio Code was used as the primary IDE due to its efficient debugging tools, Git integration, and live server support. It also provided:

- Extensions for React and TailwindCSS IntelliSense,
- REST client plugins for testing backend APIs,
- GitHub pull request management and terminal-based MongoDB shell access.

4.7 SOFTWARE REQUIREMENTS

- **IDE/Platform:** Visual Studio Code
- **Operating System:** Windows 10 or later / Ubuntu 22.04
- **Programming Languages:** JavaScript (React), Node.js
- **Libraries & Tools:**
  - Frontend: Vite, React, TailwindCSS, Zustand
  - Backend: Express.js, Firebase Admin SDK, JWT
  - Database: MongoDB + Mongoose
  - Tools: Postman, Git, GitHub

4.8 HARDWARE REQUIREMENTS

- **Processor:** Intel i5 / Ryzen 5 or higher
- **RAM:** Minimum 8 GB
- **Storage:** 5 GB free space for codebase, logs, and local MongoDB
- **Display:** 1366x768 resolution or higher
- **Internet:** Stable connection for Firebase services and GitHub sync

CHAPTER 5

SOFTWARE DESIGN

5.1 UML DIAGRAMS

UML, the Unified Modeling Language, is one of the standards language widely used which is employed to specify, build, visualize, and document software system artefacts. UML is truly a visual notation that is utilised to devise blueprints of software systems. As far as understanding any complex system goes, the best method is to draw diagrams or pictures of it. These sketches play a critical role in enabling us to understand the workings of the system. While infographics have existed for some time now, they are currently used in many industries for different reasons.

The Use Case perspective is the nucleus of the system and acts as a bridge for the other four views. Use Cases establish the primary functionality of the Academic Project Review Management System, including the submission of a project, appointment of a reviewer, review conduct, and release of results. The other views are built up from these foundational functional interactions.

The Design view of the system comprises major modules including user roles (Admin, Reviewer, Student), project tracking, and review workflows. UML Class Diagrams and Object Diagrams are employed to display the structural framework of the system, illustrating data model relationships and interactions between services in the MERN stack (MongoDB, Express, React, Node.js).

The Implementation viewpoint is concerned with the structure and deployment of the backend and frontend elements. For this purpose, UML Component Diagrams are employed to depict the logical grouping of source code modules—e.g., Express routes, React components, and MongoDB collections—into deployable units that collectively form the operational system.

The Process view in our system focuses on the communication between elements such as user authentication, project submission, and review assignment, with email notifications and status updates. The view captures the dynamic behavior of the system by using asynchronous communication between the frontend and backend and mirrors the control and data flow among different microservices.

The Deployment view defines the system's runtime environment. It specifies components like user devices (desktops/laptops), the cloud hosting provider, MongoDB Atlas cluster, and third-party services such as email APIs. UML Deployment Diagrams illustrate how these hardware and cloud-based infrastructure components communicate with software services to provide the complete functionality of the system.

The UML model is organized into two conceptual realms:

- ➔ UML Analysis modeling, where the client-side logic and interactions (e.g., project submission by students and feedback reviews by faculty) are highlighted.
- ➔ UML Configuration modeling, where system usage scenarios and internal workflows are highlighted, indicating how backend services and user interfaces work together to satisfy functional requirements.

5.1.1 USE CASE DIAGRAM

Use Case Diagrams play a critical role in representing the dynamic behavior of our Academic Project Review Management System. While other behavioral diagrams (like Activity, Sequence, State Chart, and Collaboration Diagrams) serve similar purposes, Use Case Diagrams are particularly effective for capturing high-level functional requirements. These diagrams encapsulate both internal and external interactions that drive the system’s functionality.

Use Case Diagrams are instrumental during the early stages of development, where actors (such as Admins, Students, and Reviewers) and system functionalities (like project submission, review assignment, and feedback generation) are identified. The result is a visual summary that presents the external perspective of the system's operations.

Use Case Diagrams help with the following tasks, in brief:

- Assist in gathering system-level functional requirements.
- Provide a high-level overview of user-system interactions.
- Identify internal and external entities influencing system behavior.
- Illustrate how users (actors) interact with specific system processes.

This modeling technique is especially useful when analyzing high-level requirements of the system. Each functionality is translated into a "use case" — representing a specific, goal-oriented interaction between the system and an actor. These are logically ordered and trace the user's journey from initiation to completion of a task. The core participants in these diagrams are known as "actors", which can include human users, system processes, or external applications interfacing with our platform.

In our system, actors include Students (who submit projects), Reviewers (who assess them), and Admins (who manage workflows). When constructing Use Case Diagrams, the following elements are essential:

- Each functionality of the system is represented as a use case.
- Use cases are linked to actors showing system interaction.
- Each use case outlines a series of logical steps initiated by an actor's goal and completed upon fulfillment of that goal.

- Use cases are represented using oval shapes in the diagram.

Actors

Actors in our system represent users and components interacting with the application. This includes students uploading projects, reviewers giving feedback, and the admin facilitating review cycles. These actors represent entities outside the core system that send or receive data.

Relationships

Behavioral relationships form the backbone of use case diagrams, representing various interactions between actors and use cases. The four primary behavioral relationships are: Include, Communicate, Generalize, and Extend.

Communicates

Represents direct interaction between an actor and a use case. For example, a student communicates with the "Submit Project" use case. This relationship is shown using a line connecting the actor and the use case without arrowheads.

Includes

This is used when a common behavior is shared across multiple use cases. For example, the "Send Notification" use case may be included in both "Assign Reviewer" and "Submit Review" functionalities. A dotted arrow pointing to the common use case indicates the include relationship.

Extends

Used when an optional or conditional behavior extends a basic use case. For instance, "Request Project Revision" may extend the "Submit Review" use case. This helps model alternative or exception flows.

Generalizes

Describes a more general actor or use case being reused or inherited by a more specific one. For example, the "User" actor might be generalized into "Student" and "Reviewer" sub-actors, with shared characteristics and behaviors.

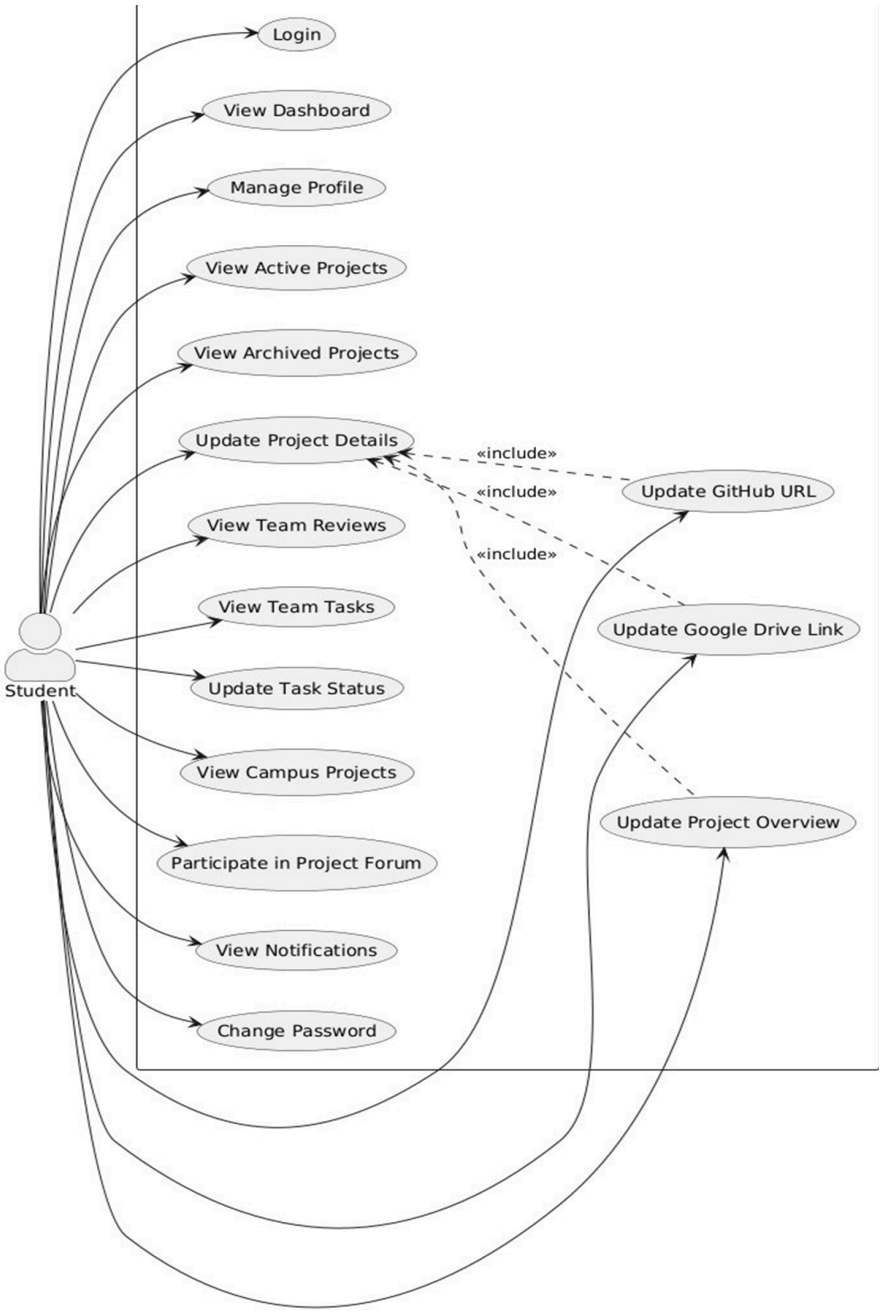

Figure 5.1: Student Use Case Diagram

The Student Use Case Diagram illustrates the various interactions a student can have with the system. Students begin by logging in, after which they can manage their profile and view both active and archived projects. They can update project details, which includes updating the GitHub URL, Google Drive link, and project overview—these shared functionalities are modeled using include relationships to avoid redundancy. Students can also view team reviews,

manage team tasks, and update their own task statuses. Additional capabilities include viewing campus-wide projects, participating in project forums, checking notifications, and changing their password. This diagram captures a holistic view of student responsibilities and interactions, emphasizing their role in collaborative project management.

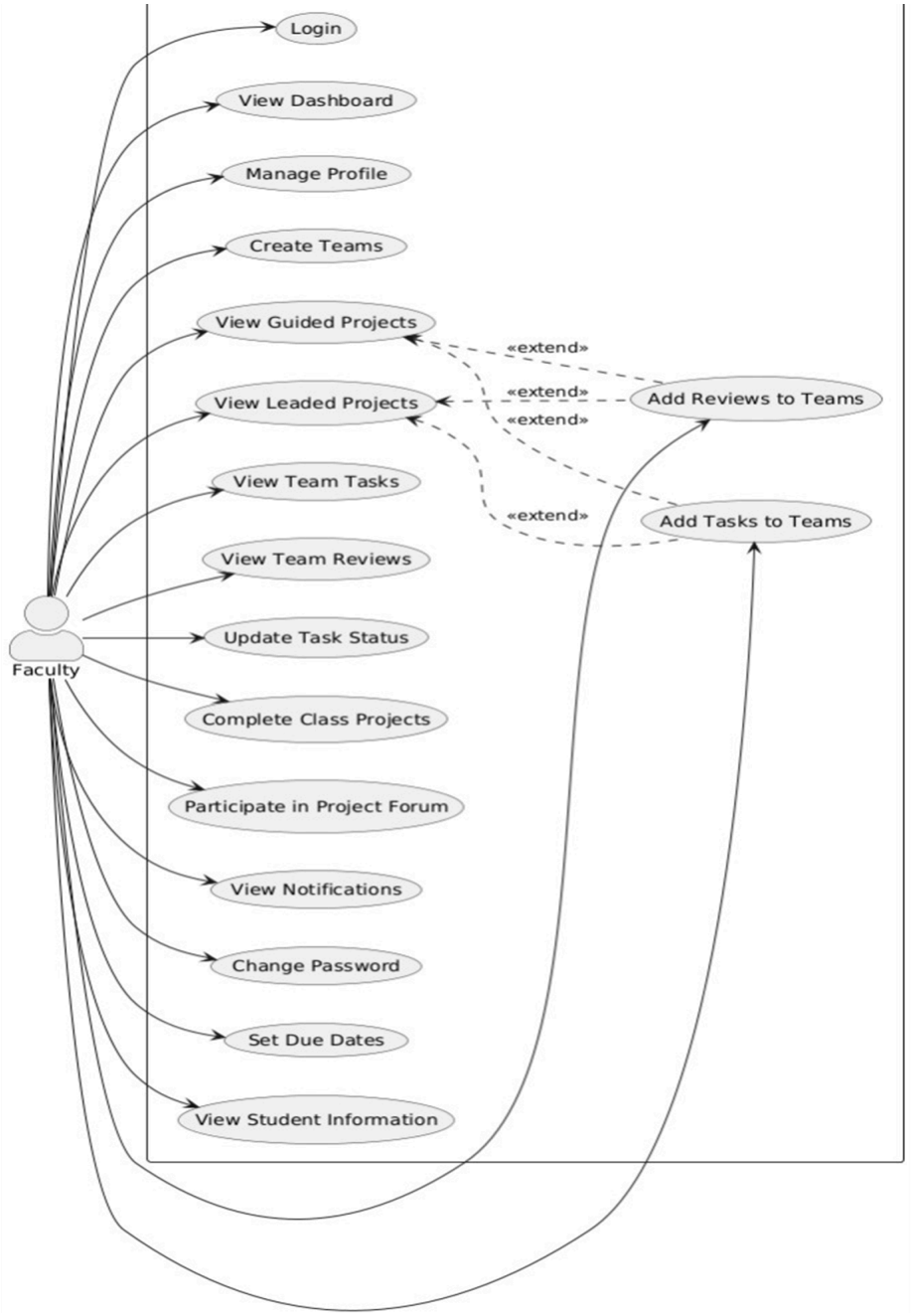

Figure 5.2: Faculty Use Case Diagram

The Faculty Use Case Diagram showcases the range of actions available to faculty members within the system. Faculty users can log in, manage their profiles, create student teams, and view guided or lead projects. Extended functionalities from lead projects include the ability to add reviews and assign tasks to specific teams, modeled using extend relationships to signify optional behavior. Faculty members can view team tasks and team reviews, update task statuses, and mark class projects as complete. Additional support functions include participating in project forums, viewing notifications, setting due dates, and accessing student information. This diagram highlights the faculty's supervisory and evaluative role in overseeing student projects and academic progress.

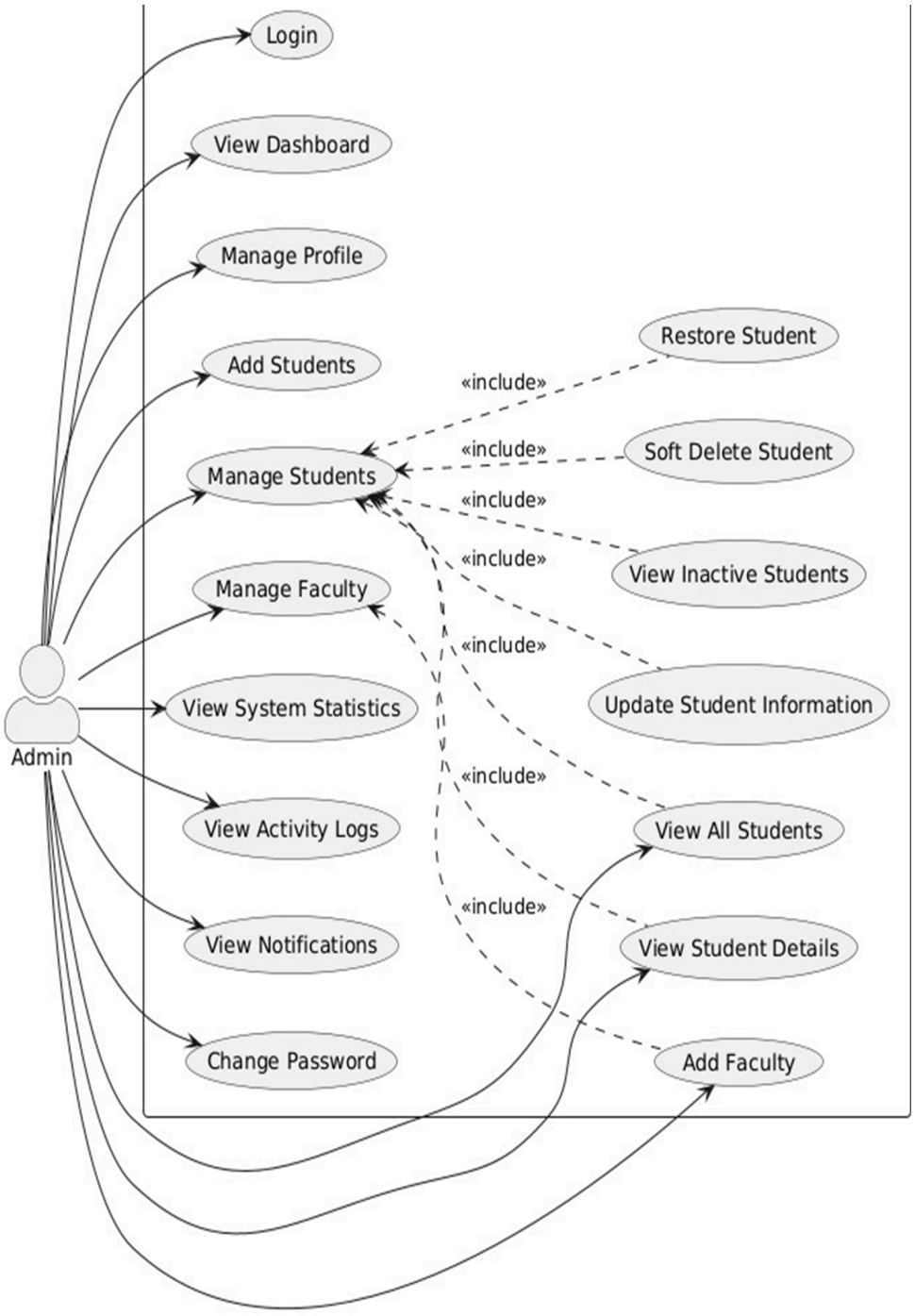

Figure 5.3: Admin Use Case Diagram

The Admin Use Case Diagram outlines the core administrative functions necessary for managing the system's users and configurations. Admins can log in, view dashboards, and manage their profiles. They can add new students, manage existing student records (including soft deletion, restoration, and updates), and handle faculty member registrations. Include relationships in this

diagram depict the shared behaviors within “Manage Students,” such as viewing inactive students, updating information, and accessing detailed records. Admins are also equipped to view system-wide statistics, monitor activity logs, access notifications, and manage password resets. This diagram emphasizes the administrative oversight and control necessary for system maintenance and data integrity.

5.1.2 CLASS DIAGRAM

A Class Diagram is a fundamental element of UML that represents the static structure of our Academic Project Review Management System by defining its classes, their attributes, methods, and relationships. In object-oriented programming, a class is a blueprint for forming instances (objects) that contain both data and behavior. Class. Diagrams are an important part of our class. design process by providing a structured presentation of how various modules — namely, users, projects, reviews, and notifications — communicate with each other. and that eventually. makes implementation and future maintenance easier.

Class Notation

One. represents a class with a typical notation split into three parts:

Class Name: Written in the. top section, denoting the identity of the class. For example, "Student", "Project", or "Reviewer".

Class Attributes: These are listed in the middle section and every attribute stands for a unit of data that the class contains. The data type of every attribute is listed after a colon. For instance, studentName: String, submissionDate: Date.

Class Operations (Methods): The lower section outlines the functions offered by the class. Every operation can have parameters and return types. For instance, submitProject(projectDetails: Object): Boolean or evaluateProject(projectID: String): Feedback.

In terms of implementation, attributes correspond to the member variables of the class, and operations correspond to the methods or functions defined in the class.

Relationships

Association: This is a general association between two or more classes wherein one class makes use of, or works in conjunction with, another. In our system, a "Reviewer" class could be associated with several "Project" instances to be reviewed. This is represented by a connecting line, which is usually tagged with role names or multiplicity (e.g., one-to-many).

Aggregation: Represents a "has-a" relationship. For example, an "Admin" class can aggregate a collection of "ReviewPanel" objects. This is represented by a hollow diamond shape at the aggregator end, indicating that the lifetime of parts is not entirely dependent on the whole.

Composition: A stronger bound type of aggregation in which the composed class cannot be on its own. For instance, a "Project" class could have a composition relationship with a "ProjectDocument" class. When the project is deleted, its related documents are also lost. This is represented by using a filled diamond symbol.

Inheritance: Is an "is-a" relationship. For example, "Student" and "Reviewer" can inherit from a common superclass "User". That is, common attributes such as username, email, and methods such as login() are declared in the parent class and inherited by the child classes. A line with a closed arrow pointing to the superclass illustrates this.

Dependency: A "uses-a" relationship in which one class is temporarily dependent on another for running. In our project, the "NotificationManager" class can be dependent on the "EmailService"

class to send notifications. This is indicated with a dashed arrow from the dependent to the independent class.

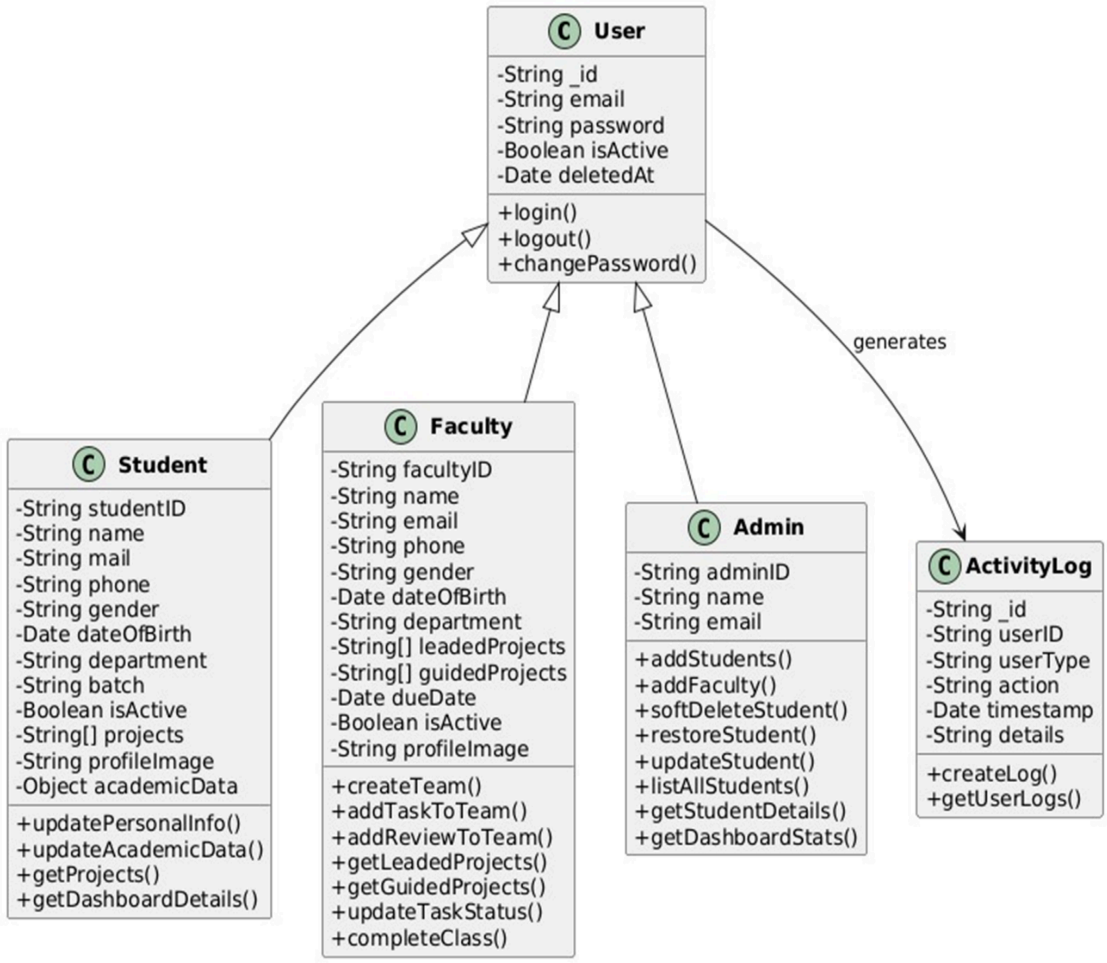

Figure 5.4: User Management Class Diagram:

The User Management Class Diagram represents the hierarchical organization and role-based interactions in the system. Around which all else revolves is the User class, which has general user credentials and account status fields, and provides capabilities such as login, logout, and password reset. From this base class are derived three specialized roles, namely Student, Faculty, and Admin. Each subclass contains role-specific information and methods, such as updating personal details for students, forming groups for staff, or handling user accounts for admins. ActivityLog belongs to the User class, keeping records of user activities such as login/logout and admin modifications. The design allows for extensibility and access control with centralized fundamental user authentication and authorization functions.

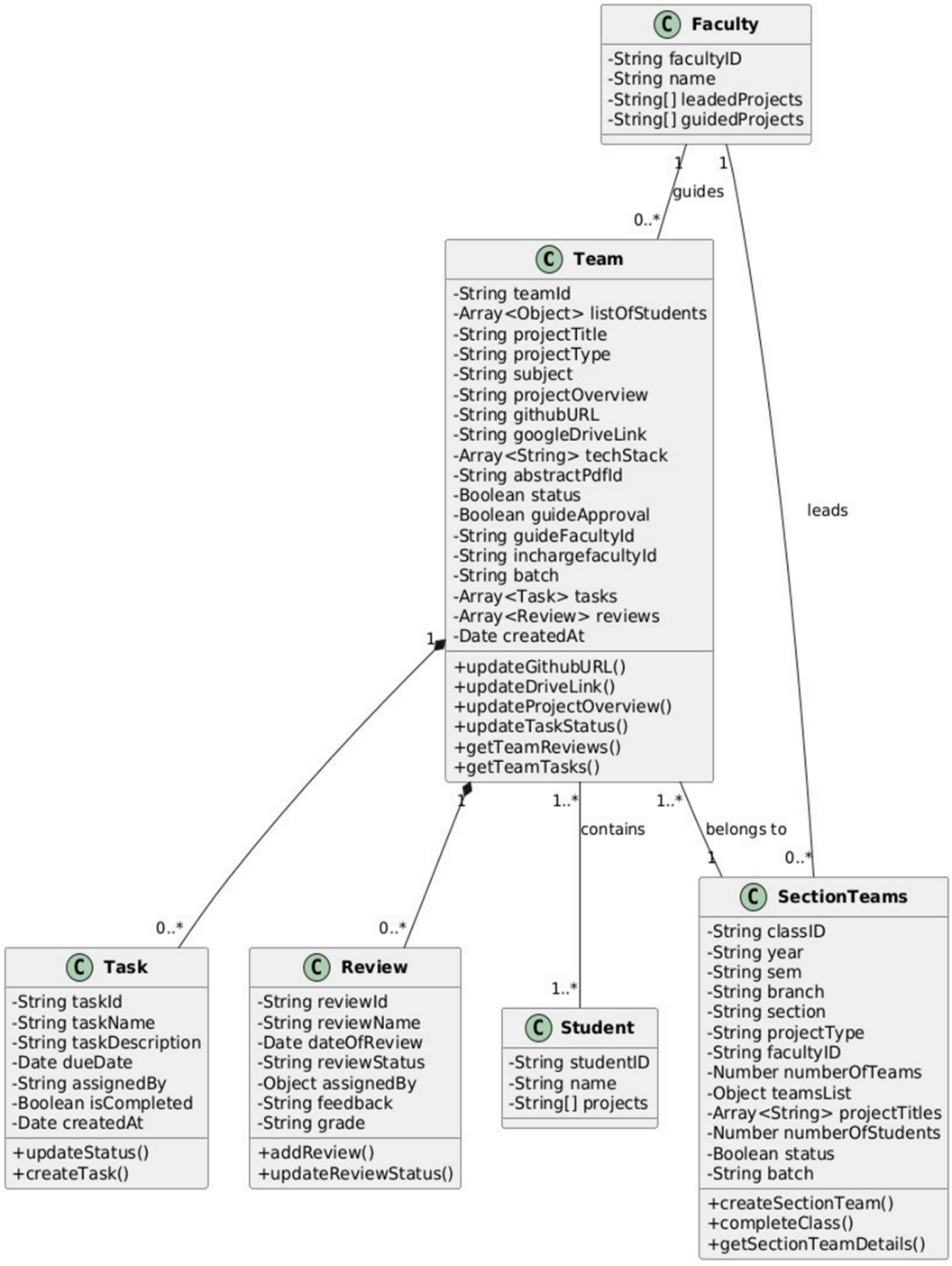

Figure 5.5: Project Management Class Diagram

The Project Management Class Diagram describes the organization of co-working academic projects. The core class, Team, is a student project team and has several students and one or more faculty members associated with it. Teams work with project details like title, type, technology

stack, and related documents, following through on project progress in associated Task and Review objects. Tasks are unit activities allocated to students, and Reviews contain evaluation comments from instructors. The SectionTeams class groups teams by academic sections, allowing batch-wise grouping and project tracking. This structure supports faculty-driven academic project workflows, organized team creation, and effective monitoring of student contributions and results.

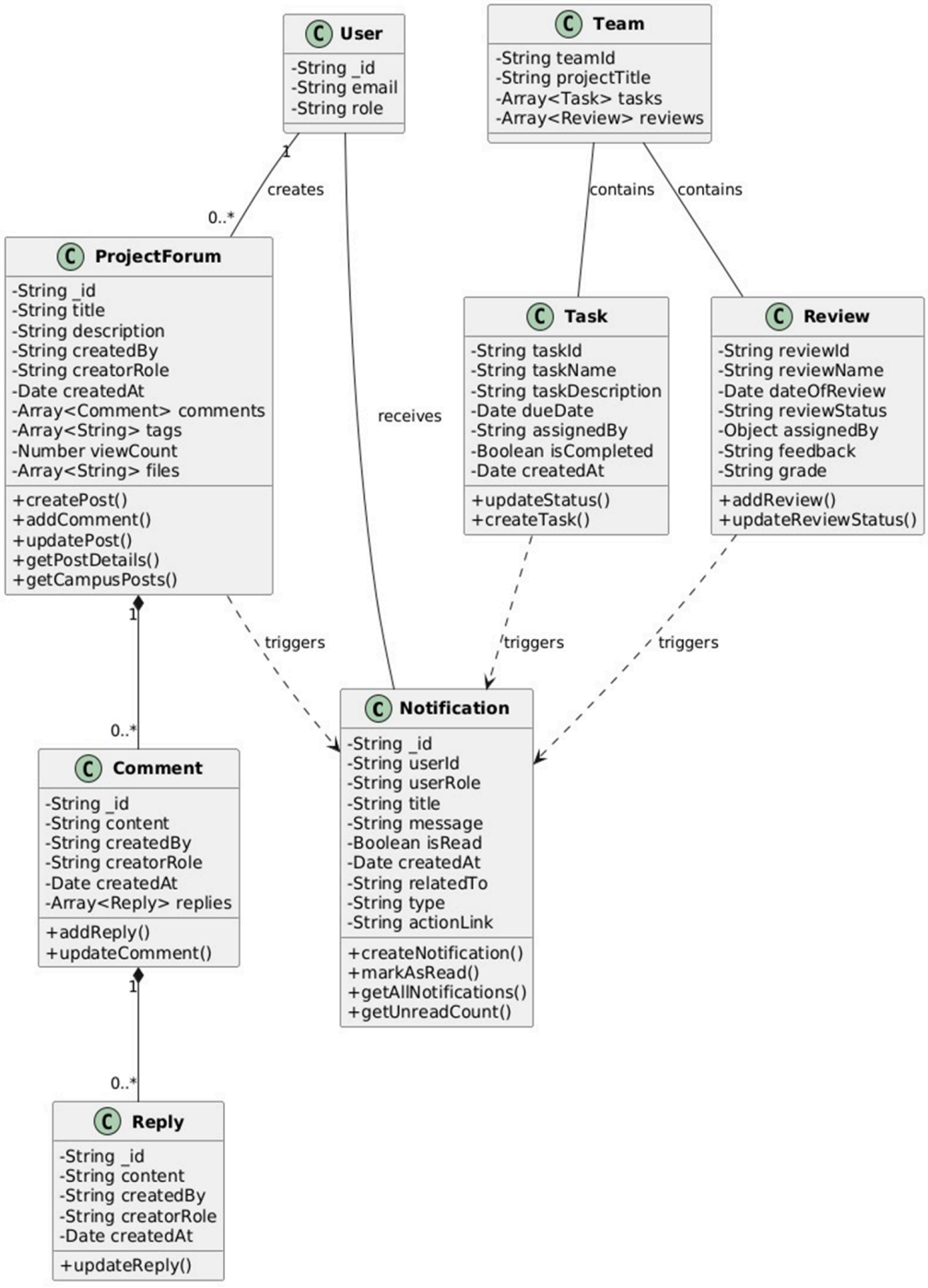

Figure 5.6: Collaboration and Communication Class Diagram

The Collaboration and Communication Class Diagram captures the interactions and engagement between users through forums and notifications. Users compose ProjectForum entries consisting of descriptions, comments, tags, and files. These entries accommodate a threaded discussion scheme using Comment and Reply classes so that responses can be layered as well as tracking content. Every comment or reply records the creator and role so that there is no confusion in the attribution. Notifications are dynamically activated by forum activity or task/review modifications and are customized according to the user's role. The Notification class holds pertinent information such as message text, creation time, and read status. This format increases real-time collaboration, user interaction, and informs participants of project and forum updates.

5.1.3 SEQUENCE DIAGRAM

A Sequence Diagram is a vital UML interaction diagram that visually captures how components of a system interact with one another in a defined sequence over time. It represents the chronological order of messages exchanged between various system entities, such as users and modules. In the context of our Academic Project Review Management System, sequence diagrams help visualize key scenarios like project submission, review assignment, and feedback generation, which supports both documentation and validation of system behavior.

Purpose of a Sequence Diagram

1. To illustrate the flow of control and interactions between users (like students, reviewers, and administrators) and system modules such as the project repository or review manager.

2. To visualize object interactions during the execution of specific use cases, such as “Submit Project” or “Assign Review Panel”.

3. To model both generalized system behavior and detailed instance-specific interactions that help refine implementation logic.

5.1.3.1 Notations

Lifeline

A lifeline represents an individual participant in the interaction, such as a user or a system component. In our system, lifelines may include entities like Student, Reviewer, Admin, ProjectController, or DatabaseService. Each lifeline is displayed at the top of the diagram and descends vertically to show the time progression.

Actor

An actor refers to a person or external system interacting with the Academic Project Review Management System. Actors include students submitting their projects, reviewers evaluating them, and administrators managing user roles. While actors might not directly belong to the internal system, they play essential roles in its operation and trigger various system functions.

Activation

Activation is shown using a thin vertical rectangle on a lifeline and represents the time duration during which a component is actively performing a task. For example, when the ProjectController is processing a submission or a Reviewer is retrieving project details, the activation bar outlines the period that component is operational.

Messages

Messages depict the flow of information between different lifelines and are shown as arrows. These illustrate how modules and users interact over time to fulfill system processes. Key message types relevant to our project include:

- **Call Message:** This denotes a direct invocation of an operation, such as a Student invoking submitProject() on the ProjectController.

- **Self-Message:** Occurs when an object sends a message to itself, useful in internal module operations like a Reviewer re-validating a review entry using validateReview().

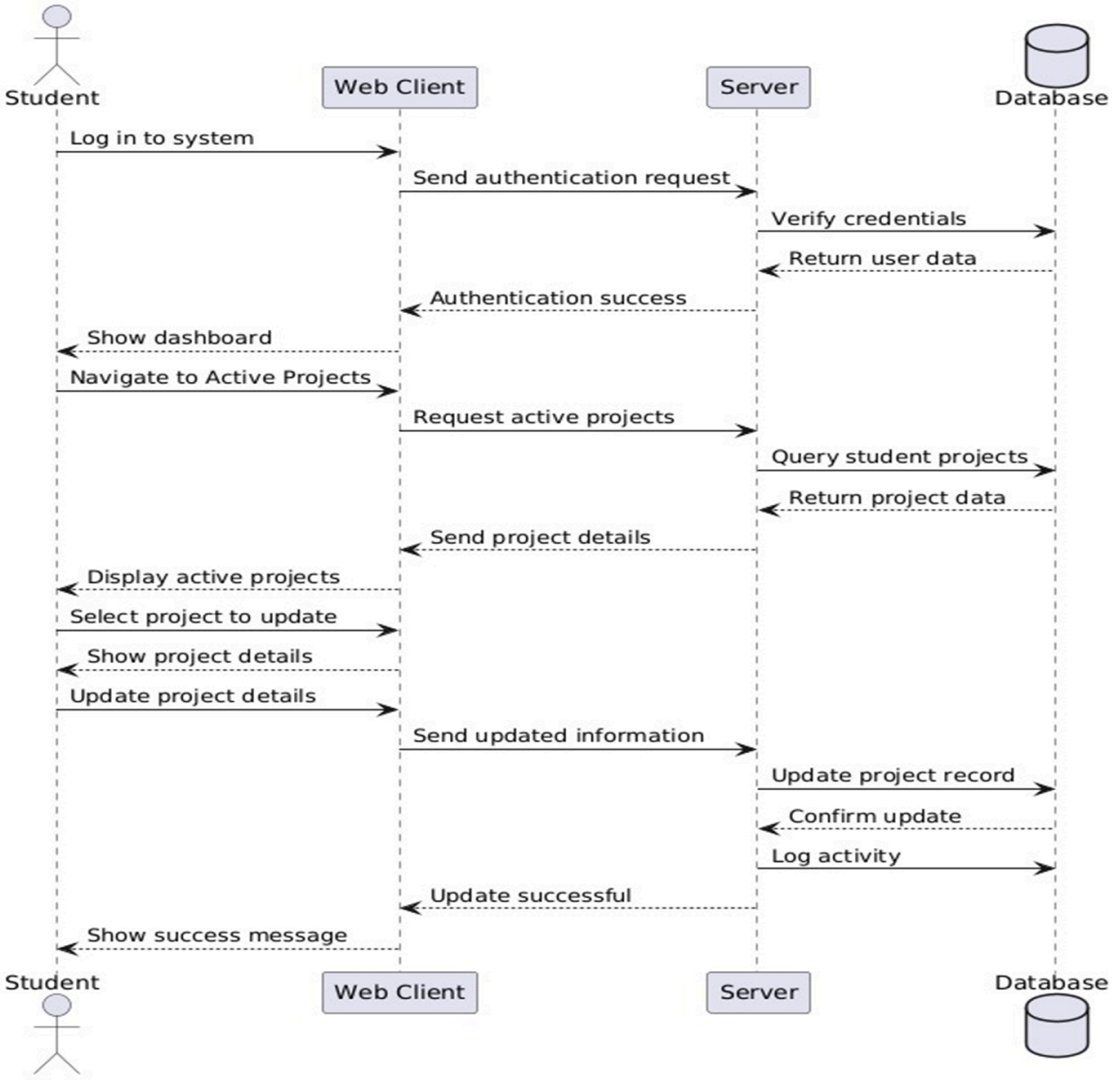

Figure 5.7: Student Project Update Sequence Diagram

This diagram outlines the process a student follows to update project details within the system. It starts with the student logging into the system, which triggers the web client to send an authentication request to the server. The server verifies the credentials with the database and returns user data upon success. Once authenticated, the student navigates to "Active Projects", prompting the client to request the student's active projects from the server. The server queries the database, retrieves the relevant project data, and returns it to the client. The student then selects a specific project to update, views its details, and submits the updated information. This updated data is sent to the server, which updates the project record in the database, logs the

activity, and confirms the successful update back to the client. The student receives a success message confirming the changes.

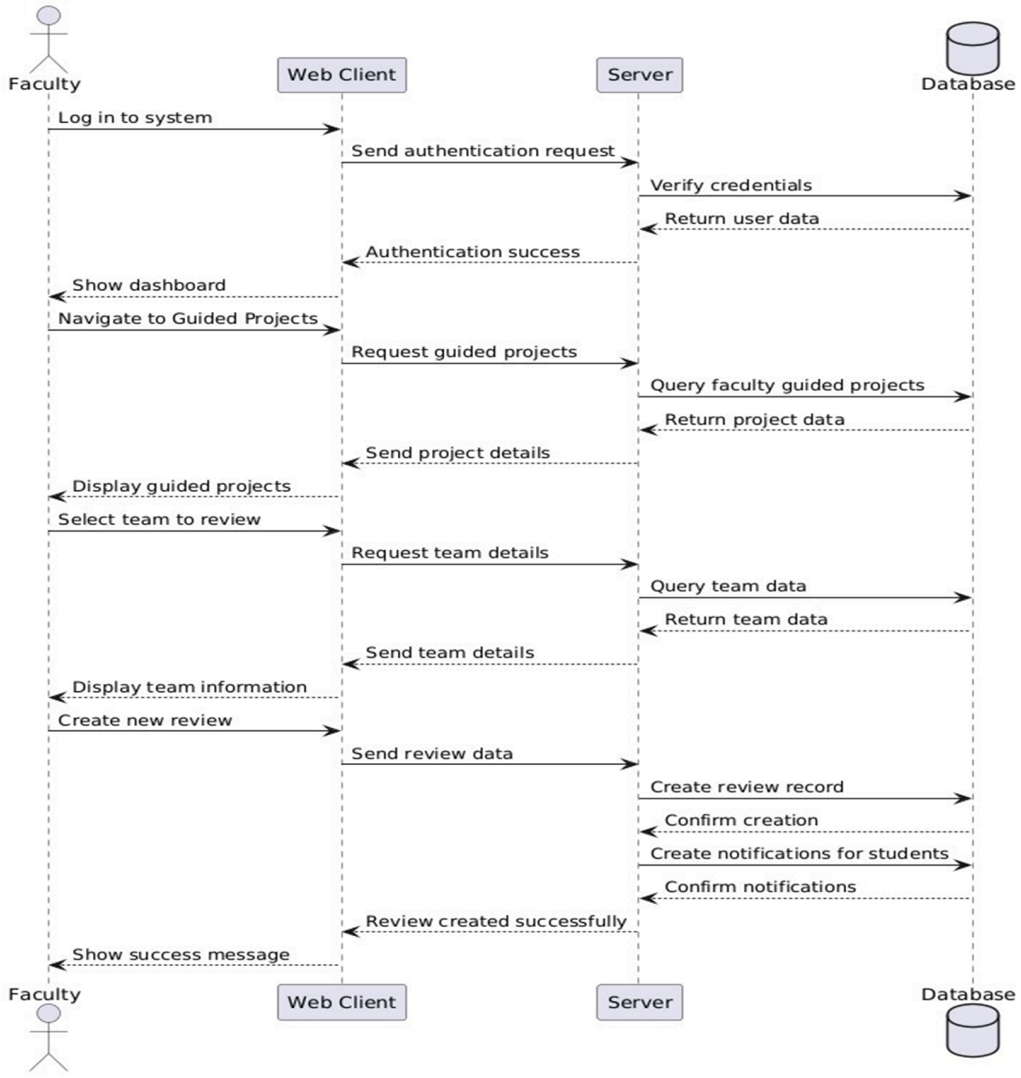

Figure 5.8:Faculty Review Assignment Sequence Diagram

This sequence diagram illustrates how a faculty member reviews student project teams. The process begins with the faculty logging into the system, followed by the web client sending an authentication request. After credentials are verified and authentication is confirmed, the faculty navigates to the "Guided Projects" section. The client then requests the list of guided projects from the server, which queries the database and returns the data. The faculty selects a team to review, prompting the client to request team details. The server retrieves and sends back the team information from the database. The faculty then creates a new review, and the web client sends

this review data to the server. The server creates the review record, confirms its creation, and generates notifications for the relevant students. Once notifications are confirmed, the client displays a success message to the faculty.

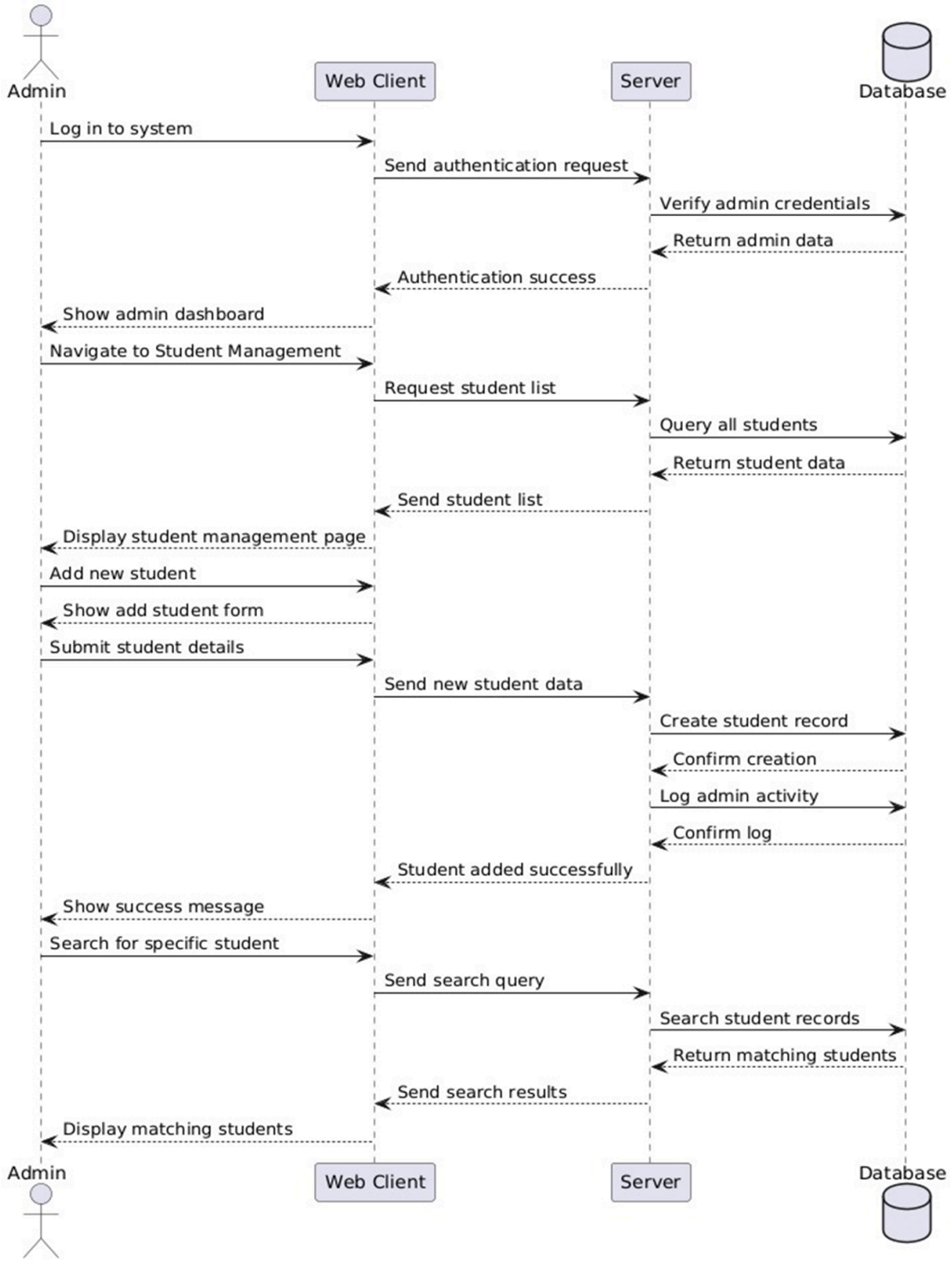

Figure 5.9:Admin Student Management Sequence Diagram

This diagram describes how an admin manages student records. Initially, the admin logs into the system, and the web client sends an authentication request to the server. After verifying credentials with the database and receiving authentication success, the admin navigates to the "Student Management" section. The web client then requests a list of all students, which the server retrieves from the database and returns. The admin can add a new student by accessing the add form and submitting student details, which are sent to the server. The server creates a new student record in the database, confirms the creation, and logs the admin's activity. The log confirmation and success message are then sent back to the admin. Additionally, the admin can search for a specific student by submitting a query, which the server processes by returning matching student records from the database.

5.1.4 ACTIVITY DIAGRAM

An Activity Diagram illustrates the flow of data or control in a system, demonstrating how the system moves from one activity to another. In our Academic Project Review Management System, activity diagrams describe dynamic behavior like project submission processes, review allocations, and approval of evaluations. Activity diagrams facilitate mapping out action sequences and the logic controlling transitions between them. The flow of the system can be sequential, have branching conditions (such as reviewer availability), or consist of parallel processes (such as multiple reviews running concurrently). Constructs like forks, joins, decisions, and merges are employed to represent these transitions efficiently.

Activity diagrams capture the functional nature of the other interaction diagrams but, unlike sequence or collaboration diagrams, do not depict direct message passing between system objects. Rather, they specialize in the step-by-step flow of actions stimulated within the system.

In this project, an activity could be a student's uploading of a project, an admin assigning reviewers to a project, or reviewers giving evaluation feedback. While they look like standard flowcharts, activity diagrams are different because they focus on object-oriented processes and control flow.

These diagrams are very flexible to model various operations in our system, e.g., login verification, file management, or dashboard data filtering. They capture the procedural logic employed in both frontend interactions and backend processing.

Activity Diagram Notations

● Initial point or start point

The beginning of an activity diagram is indicated by a small filled circle and an arrow. For instance, this might indicate the beginning of a "Submit Project" process after a student logs in. In swimlane diagrams (e.g., student, admin, reviewer lanes), the beginning point is generally located at the top-left corner of the first lane.

● Activity or Action state

An action state represents an atomic, uninterruptible activity performed by the user or the system. Some examples are actions such as "Upload Project File," "Verify Credentials," or "Notify Reviewer." These are usually represented as rectangles with curved corners.

● Action flow

The control flow, or transition among action states, is indicated by arrowed lines. The arrows specify how one action leads to another. For example, following "Upload Project," control can transfer to "Notify Admin" or "Display Confirmation."

● Decisions and branching

Decision points are represented by diamonds and come into play where more than one path can branch out from a single activity. A typical example is: following review by an admin on a project submission, the decision node can point to either "Assign Review Panel" or "Request Resubmission," depending on pre-established conditions. Each outgoing arrow should be annotated with a condition or guard expression (e.g., [Valid Project] or [Invalid Format]). One path can be marked as "else" for default logic.

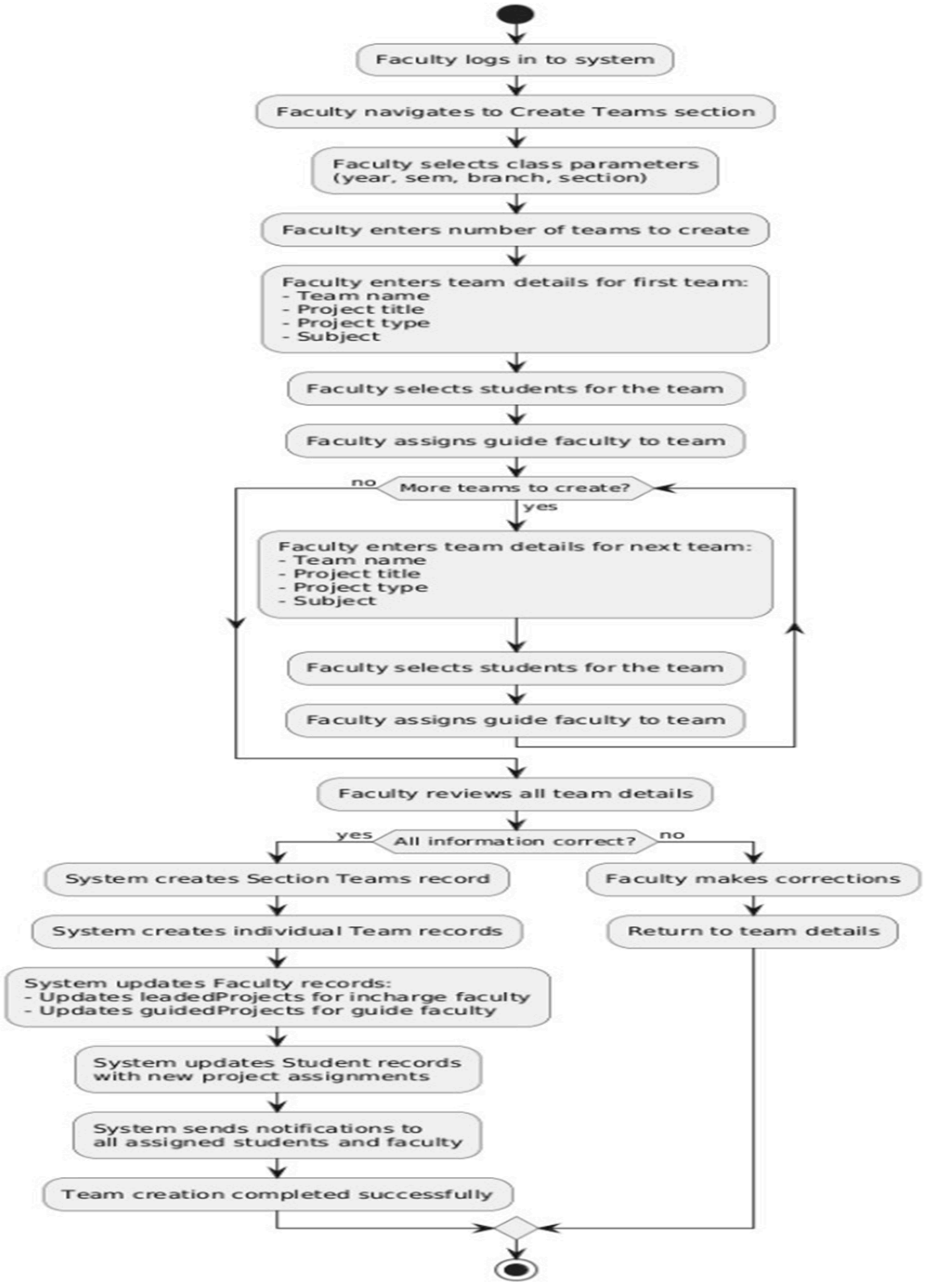

Figure 5.10:Faculty Team Creation Activity Diagram

This activity diagram illustrates the process faculty follow to create project teams within the system. It begins with the faculty logging in and navigating to the “Create Teams” section, where

they select class parameters like year, semester, branch, and section. They then specify the number of teams to be created and proceed to enter detailed information for each team, including team name, project title, project type, and subject. The faculty then selects the students for each team and assigns a guide faculty member. This process repeats if multiple teams are to be created. Once all teams are defined, the faculty reviews the information for accuracy. If corrections are needed, they return to edit the team details; otherwise, the system creates records for section teams and individual teams. It also updates faculty records to reflect leadership and guidance roles, updates student records with their assignments, and sends notifications to all involved. The process concludes with a confirmation of successful team creation.

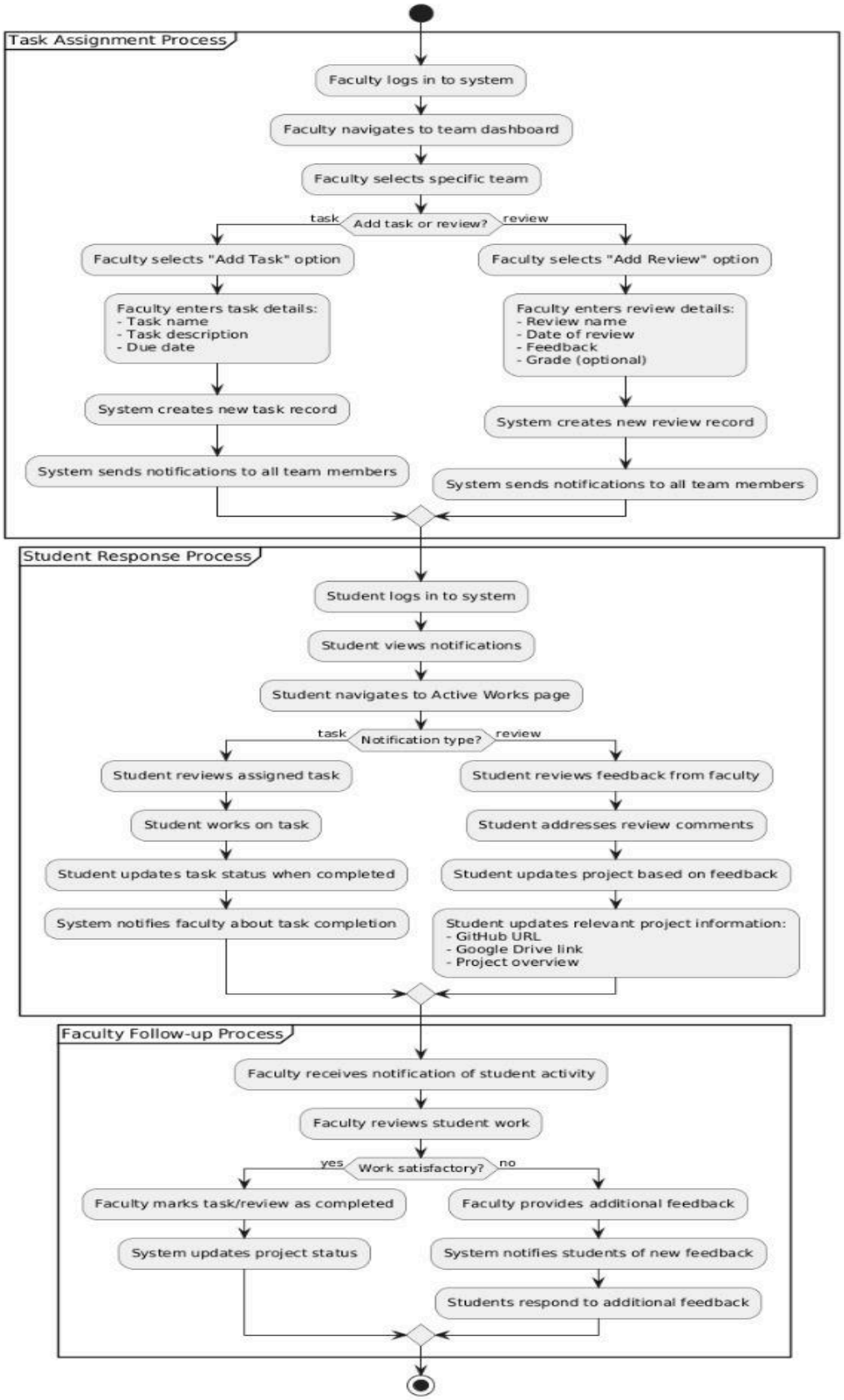

Figure 5.11: Review and Task Management Workflow Activity Diagram

This single activity diagram lays out the entire process of task and review management between students and faculty in a project-based education system. It begins with the faculty logging on to the system, choosing a team, and opting to assign a task or begin a review. For tasks, name, description, and due date are entered; for reviews, grading and feedback are added by the faculty. Notifications are sent once they are submitted to the students concerned. At the student response stage, they login, go through their notifications, and work on tasks or review feedback accordingly. Once they complete it, they update the system with project progress and necessary project details. Faculty follow-up is the final step where faculty review the work of the student and mark it complete or provide further feedback in case it does not meet their expectations. The system also provides updates and communication at every stage, maintaining smooth coordination and progress tracking.

5.1.5.COMPONENT DIAGRAM

A Component Diagram in UML is used to visualize the organization and dependencies of software components in a system. In the context of our Academic Project Review Management System, component diagrams depict how various logical modules such as the frontend interface, backend services, database, and external APIs interact and depend on one another. These diagrams offer a high-level view of the system architecture, making it easier to understand how the application is modularized and how responsibilities are distributed across the MERN (MongoDB, Express.js, React, Node.js) stack.

In our system, major components include the user authentication module, project submission module, review management service, notification handler, and database access layer. Each component has well-defined interfaces that expose its functionality to other modules. For instance, the "Project Upload" component communicates with the backend via an API layer exposed by the Express server, while the “Reviewer Panel” component interacts with the database through Node.js services.

Component diagrams are especially useful during the design and development phases, as they help developers visualize dependencies and service contracts between different modules. They also assist in identifying reusable components and ensuring separation of concerns across the system.

These diagrams are essential for ensuring smooth integration, especially when working in a team environment. By visually representing how components are connected, they support better planning, reduce coupling between modules, and help in tracking changes or debugging integration issues.

In our MERN-based system, the modular architecture improves maintainability and scalability. The diagram clearly maps out how the front end (React) interacts with back-end logic (Node.js and Express), and how data persistence is handled through MongoDB. The use of RESTful APIs as connectors is often represented as interfaces between these components, highlighting data flow and request-response mechanisms.

Component Diagram Notations

- **Component**

Each component is shown as a rectangular box with two small rectangles protruding from the left side. It represents a functional unit such as "Login Service," "Admin Dashboard," or "Review Assignment Handler." These components encapsulate related functionalities and may contain internal classes, logic, or APIs.

- **Interface**

Interfaces, depicted as lollipop symbols (or circles), define the services provided or required by components. For example, the “Notification Service” may provide an interface consumed by both admin and reviewer modules to send alerts.

- **Dependencies**

Arrows or dashed lines represent dependency relationships between components. These are labeled to show which module relies on another. For instance, the “Student Module” depends on the “Authentication Service” for login validation.

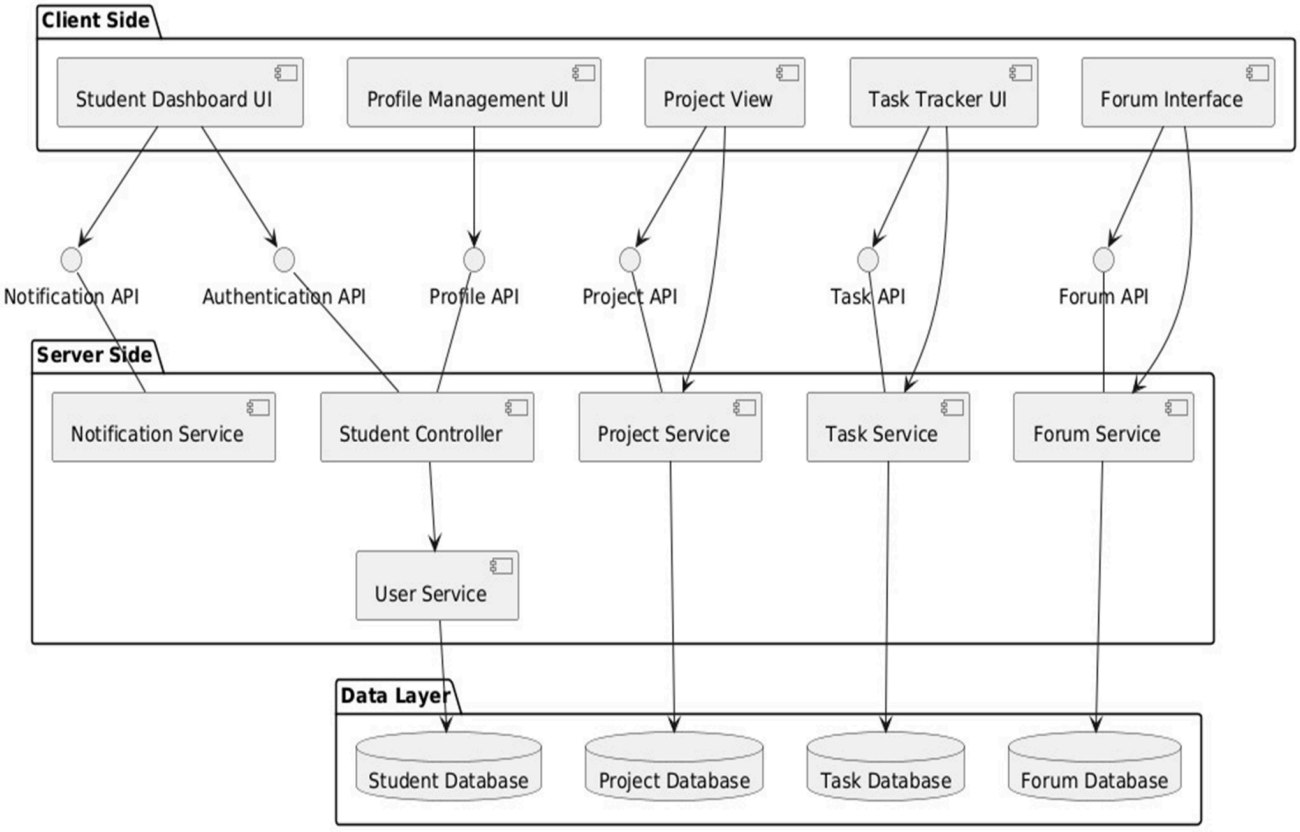

Figure 5.12:Student Subsystem Component Diagram

The Student Subsystem is structured into three layers: Client Side, Server Side, and Data Layer. The Client Side features user interfaces such as the Student Dashboard UI, Profile Management UI, Project View, Task Tracker UI, and Forum Interface. These interact with various APIs—like Notification, Authentication, Profile, Project, Task, and Forum APIs—that bridge the front end with the back end. The Server Side consists of services such as Notification Service, Student Controller, Project Service, Task Service, and Forum Service, with the Student Controller interfacing with the User Service. The Data Layer holds multiple databases—Student, Project, Task, and Forum—which store relevant data for each module. This modular design enhances scalability and separation of concerns, facilitating maintainability and development.

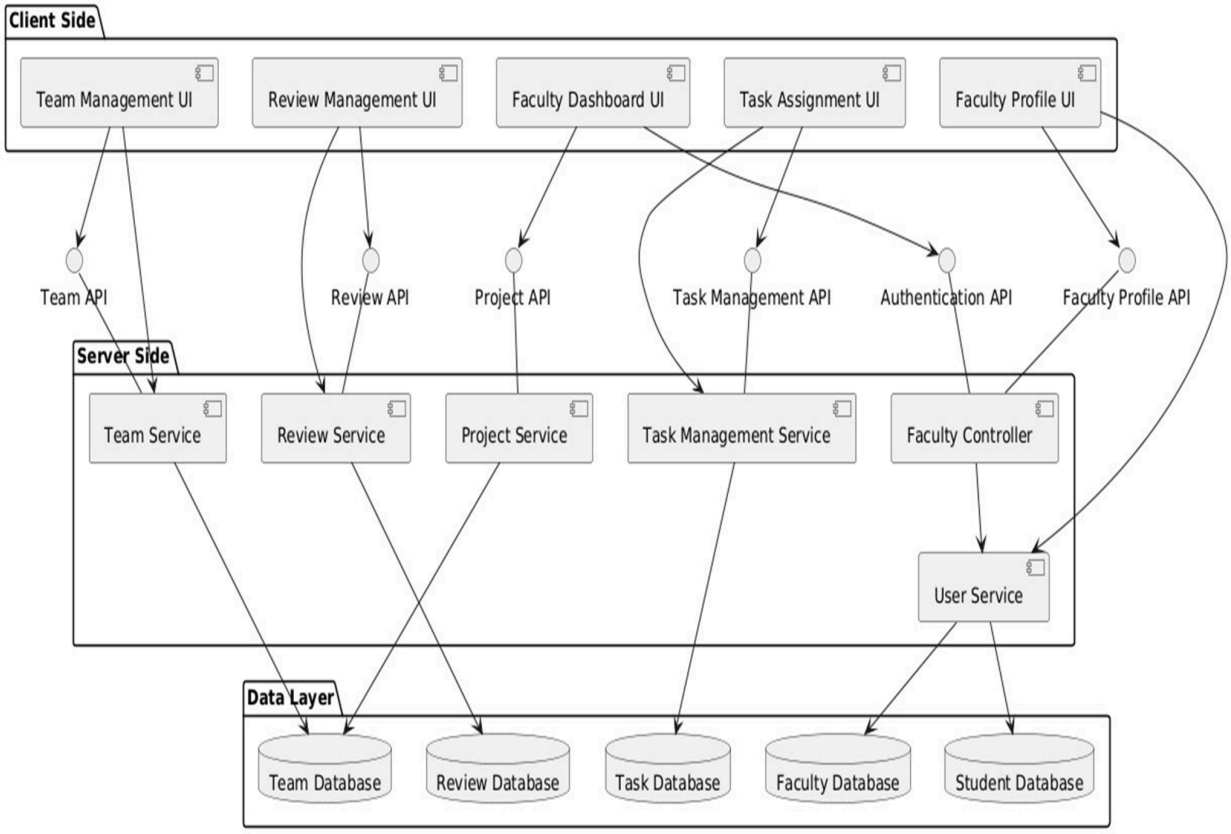

Figure 5.13: Faculty Subsystem Component Diagram

The Faculty Subsystem mirrors a modular architecture with a Client Side that includes UIs such as Team Management, Review Management, Faculty Dashboard, Task Assignment, and Faculty Profile. Each UI communicates with its corresponding API—Team, Review, Project, Task Management, Authentication, and Faculty Profile APIs. On the Server Side, services like Team Service, Review Service, Project Service, Task Management Service, and Faculty Controller handle the business logic. The Faculty Controller connects with the User Service to manage authentication and user-related operations. The Data Layer contains Team, Review, Task, Faculty, and Student Databases. This subsystem supports faculty functionalities such as team oversight, task distribution, and student review handling in a robust and well-structured manner.

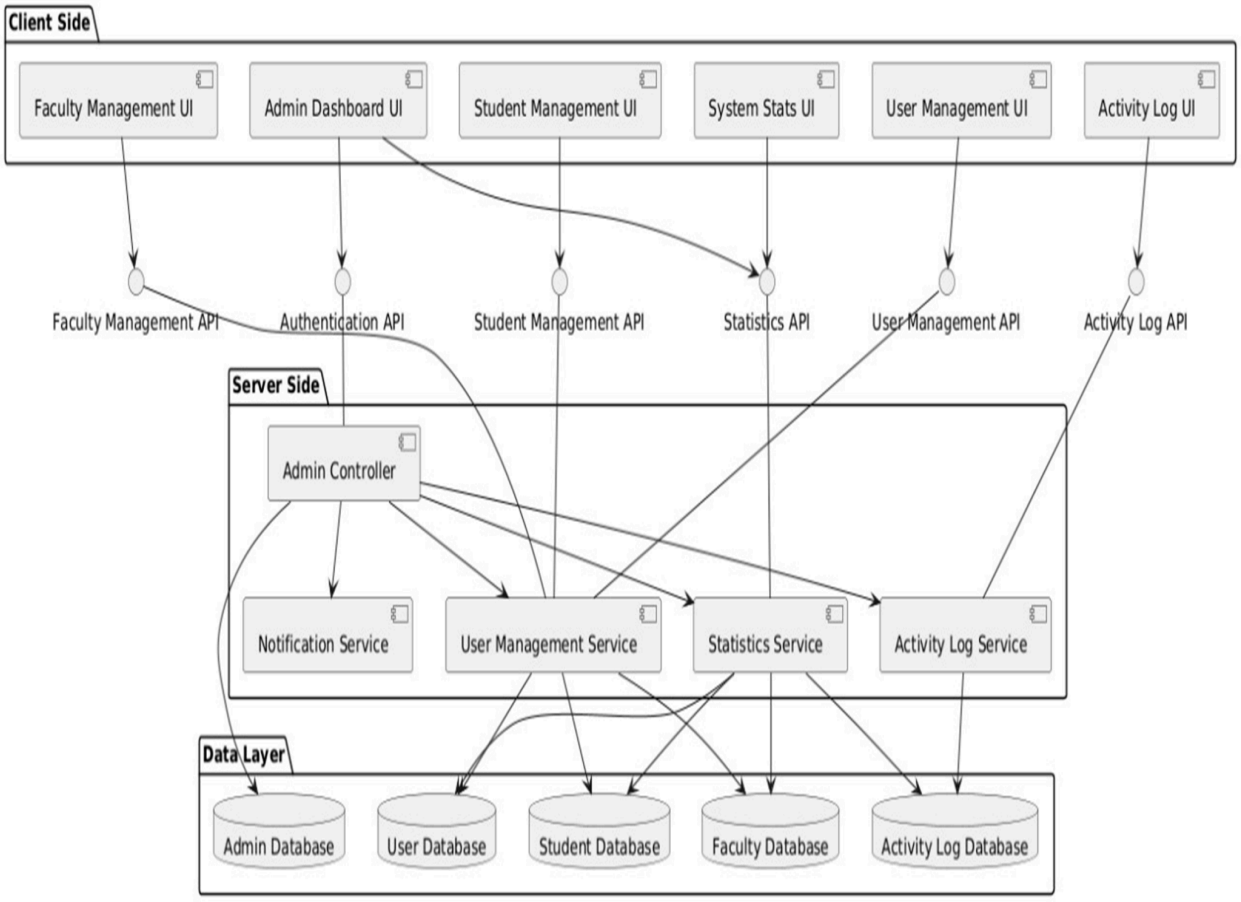

Figure 5.14: Admin Subsystem Component Diagram

The Admin Subsystem is composed of several UIs on the Client Side: Faculty Management, Admin Dashboard, Student Management, System Stats, User Management, and Activity Log. These interfaces interact with APIs like Faculty Management, Authentication, Student Management, Statistics, User Management, and Activity Log APIs. The Server Side contains the Admin Controller, Notification Service, User Management Service, Statistics Service, and Activity Log Service. The Admin Controller is the central hub that coordinates with all services, especially User and Notification Services. The Data Layer includes Admin, User, Student, Faculty, and Activity Log Databases, ensuring organized data storage. This architecture empowers admins to manage the system efficiently with a focus on oversight, data integrity, and user monitoring.

CHAPTER 6

CODING AND IMPLEMENTATION

App.jsx

```
import { BrowserRouter as Router, Routes, Route } from "react-router-dom";

import Login from "./modules/Login/Login";

import AdminLayout from "./modules/Admin/AdminLayout";

import FacultyLayout from "./modules/Faculty/FacultyLayout";

import Dashboard from "./modules/Student/Dashboard";

import ArchivedProjects from "./modules/Student/ArchivedProjects/ArchivedProjects";

import ArchivedProjectDetails from "./modules/Student/ArchivedProjects/ArchivedProjectDetails";

import ChangePassword from "./modules/Student/ChangePassword";

import Profile from "./modules/Student/Profile/Profile";

import FacultyDashboard from './modules/Faculty/Dashboard'

import GuideArchivedProjects from './modules/Faculty/ArchivedProjects/Guide/GuideArchivedProjects'

import GuideArchivedProjectDetails from
'./modules/Faculty/ArchivedProjects/Guide/GuideArchivedProjectDetails'

import InchargeArchivedProjects from
'./modules/Faculty/ArchivedProjects/Incharge/InchargeArchivedProjects'

import InchargeClass from './modules/Faculty/ArchivedProjects/Incharge/InchargeClass'

import InchargeArchivedProjectDetails from
'./modules/Faculty/ArchivedProjects/Incharge/InchargeArchivedProjectDetails'
```

```
import FacultyProjectForum from './modules/Faculty/ProjectForum/FacultyProjectForum';

import InchargeActiveWorks from './modules/Faculty/ActiveWorks/Incharge/InchargeActiveWorks';

import InchargeClassTeams from './modules/Faculty/ActiveWorks/Incharge/InchargeClassTeams';

import InchargeProjectDetails from './modules/Faculty/ActiveWorks/Incharge/InchargeProjectDetails';

import CreateProjectForm from './modules/Faculty/CreateProject/CreateProjectForm';

import ForumProjectDetails from './modules/Faculty/ProjectForum/ForumProjectDetails';

import ProjectForum from './modules/Student/ProjectForum/ProjectForum';

import ActiveWorks from './modules/Student/ActiveWorks/ActiveWorks';

import CampusProjects from './modules/common/CampusProjects';

import GuideProjectDetails from './modules/Faculty/ActiveWorks/Guide/GuideProjectDetails';

import ProjectDetails from './modules/Student/ActiveWorks/ProjectDetails';

import { Toaster } from 'react-hot-toast';

import GuideActiveWorks from "./modules/Faculty/ActiveWorks/Guide/GuideActiveWorks";

import Student from "./modules/Student/StudentLayout";

import FacultyProfile from "./modules/Faculty/Profile/FacultyProfile";

import { Navigate, Outlet, useLocation } from "react-router-dom";

import AdminDashboard from './modules/Admin/Dashboard';

import AdminProfile from './modules/Admin/Profile';

import AdminFacultyManagement from './modules/Admin/AdminFacultyManagement';

import AdminStudentManagement from './modules/Admin/AdminStudentManagement';

import AddStudent from './modules/Admin/AddStudent';
```

```
import AddFaculty from './modules/Admin/AddFaculty';

import StudentView from './modules/Admin/StudentView';

import ViewFaculty from './modules/Admin/ViewFaculty';

import { useStore } from "./store/useStore";

import ProjectForumDetails from './modules/Student/ProjectForum/ProjectForumDetails';

import Notifications from './modules/Faculty/Notifications';

import StudentNotifications from "./modules/Student/StudentNotifications";

import ResetPassword from './modules/common/ResetPassword';

import { ToastContainer } from 'react-toastify';

import 'react-toastify/dist/ReactToastify.css';

import NotificationComponent from './modules/Notification/NotificationComponent';



// Component to conditionally render the NotificationComponent

const ConditionalNotification = () => {

  const { isAuthenticated, user } = useStore();

  const location = useLocation();



  // Don't show notifications on login or reset password pages

  const isAuthPage = location.pathname === '/' || location.pathname === '/reset-password';



  // Return null on auth pages or if not authenticated
```

```
  if (!isAuthenticated || isAuthPage || !user) {
    return null;
  }

  // Otherwise render the notification component
  return <NotificationComponent />;
};

function App() {
  const PrivateRoute = ({ allowedRoles }) => {
    const { user, isAuthenticated } = useStore();

    if (!isAuthenticated || !allowedRoles.includes(user?.role)) {
      return <Navigate to="/" />;
    }

    return <Outlet />;
  };

  return (
    <>
```

```
<Router>
  {/* <ConditionalNotification /> */}
  <Toaster
    position="top-center"
    toastOptions={{
      duration: 3000,
      style: {
        background: '#333',
        color: '#fff',
      },
      success: {
        style: {
          background: '#22c55e',
        },
      },
      error: {
        style: {
          background: '#ef4444',
        },
      },
    }}
```

```
/>
<ToastContainer
  position="top-center"
  autoClose={4000}
  hideProgressBar={false}
  newestOnTop
  closeOnClick
  rtl={false}
  pauseOnFocusLoss
  draggable
  pauseOnHover
  theme="colored"
/>
<Routes>
  <Route path="/" element={<Login />} />
  <Route path="/reset-password" element={<ResetPassword />} />

  {/* Admin Routes */}
  <Route element={<PrivateRoute allowedRoles={["admin"]} />}>
    <Route path="/Admin" element={<AdminLayout />}>
      <Route path="Dashboard" element={<AdminDashboard />} />
```

```
        <Route path="Profile" element={<AdminProfile />} />
        <Route path="CampusProjects" element={<CampusProjects />} />
        <Route path="Faculty" element={<AdminFacultyManagement />} />
        <Route path="Faculty/:facultyId" element={<ViewFaculty />} />
        <Route path="Students" element={<AdminStudentManagement />} />
        <Route path="Students/:studentId" element={<StudentView />} />
        <Route path="AddStudent" element={<AddStudent />} />
        <Route path="AddFaculty" element={<AddFaculty />} />
      </Route>
    </Route>

    {/* Faculty Routes */}
    <Route element={<PrivateRoute allowedRoles={["faculty"]} />}>
      <Route path="/Faculty" element={<FacultyLayout />}>
        <Route path="Dashboard" element={<FacultyDashboard />} />
        <Route path="ActiveWorks/guide" element={<GuideActiveWorks />} />
        <Route path="ActiveWorks/guide/:projectId" element={<GuideProjectDetails />} />
        <Route path="ActiveWorks/Incharge" element={<InchargeActiveWorks />} />
        <Route path="ActiveWorks/Incharge/:classSection" element={<InchargeClassTeams />} />
        <Route path="ActiveWorks/Incharge/:classSection/:projectId" element={<InchargeProjectDetails
/>} />
```

```
          <Route path="ArchivedProjects/Guide" element={<GuideArchivedProjects />} />

          <Route path="ArchivedProjects/Guide/:projectId" element={<GuideArchivedProjectDetails />} />

          <Route path="ArchivedProjects/Incharge" element={<InchargeArchivedProjects />} />

          <Route path="ArchivedProjects/Incharge/:classSection" element={<InchargeClass />} />

          <Route path="ArchivedProjects/Incharge/:classSection/:projectId"
element={<InchargeArchivedProjectDetails />} />

          <Route path="CampusProjects" element={<CampusProjects />} />

          <Route path="ProjectForum" element={<FacultyProjectForum />} />

          <Route path="ProjectForum/:projectId" element={<ForumProjectDetails />} />

          <Route path="Create" element={<CreateProjectForm />} />

          <Route path="FacultyProfile" element={<FacultyProfile />} />

          <Route path="Notifications" element={<Notifications />} />

        </Route>

      </Route>



      {/* Student Routes */}

      <Route element={<PrivateRoute allowedRoles={["student"]} />}>

        <Route path="/student" element={<Student />}>

          <Route path="dashboard" element={<Dashboard />} />

          <Route path="archivedprojects" element={<ArchivedProjects />} />

          <Route path="archivedprojects/:projectId" element={<ArchivedProjectDetails />} />
```

```
            <Route path="profile" element={<Profile />} />
            <Route path="changepassword" element={<ChangePassword />} />
            <Route path="projectforum" element={<ProjectForum />} />
            <Route path="projectforum/:projectId" element={<ProjectForumDetails />} />
            <Route path="activeworks" element={<ActiveWorks />} />
            <Route path="activeworks/:projectId" element={<ProjectDetails />} />
            <Route path="campusprojects" element={<CampusProjects />} />
            <Route path="notifications" element={<StudentNotifications />} />
          </Route>
        </Route>
      </Routes>
    </Router>
  </>
 );
}

export default App;
```

The App.jsx file serves as the central hub and main entry point of the React application, implementing a comprehensive routing and authentication system. It utilizes React Router for client-side navigation and implements role-based access control through a custom PrivateRoute component that verifies user authentication and permissions. The application is structured into three main user roles: Admin, Faculty, and Student, each with their own dedicated layouts and routes. The Admin section provides access to dashboard, profile management, faculty and student management features, while the Faculty section includes project

management, archived projects, and project forum functionalities. The Student section offers access to dashboard, archived projects, profile management, and project-related features. The file also implements a robust notification system using both Toaster and ToastContainer components for different types of user feedback, and includes a ConditionalNotification component that displays notifications based on the user's authentication state. Security is maintained through protected routes and role-based access control, ensuring that users can only access features appropriate to their role. The application also includes common features like password reset functionality and campus project viewing, making it a comprehensive platform for managing academic projects and user interactions.

CHAPTER 7

TESTING

7.1 Frontend Testing

The frontend testing focuses on ensuring the proper functioning and user experience of the client-side application. Component testing involves verifying that all UI components render correctly, maintain proper styling, and respond appropriately to user interactions. Page testing ensures that all application pages load correctly, navigation between pages works smoothly, and page-specific features function as intended. This testing is crucial for maintaining a consistent and responsive user interface.

7.2 Backend Testing

Backend testing verifies the server-side functionality of the application. API testing ensures that all endpoints respond correctly to requests, process data accurately, and handle errors appropriately. Database testing focuses on verifying the integrity of data operations, ensuring that create, read, update, and delete operations work correctly, and that data relationships are maintained properly. This testing is essential for maintaining data consistency and system reliability.

7.3 Integration Testing

Integration testing examines how different parts of the system work together. System integration testing verifies that the frontend and backend communicate effectively, data flows correctly between components, and the system maintains consistency across all operations. Third-party integration testing ensures that external services and APIs integrate properly with the system, maintaining data exchange and authentication flows. This testing is critical for ensuring seamless system operation.

7.4 User Interface Testing

User interface testing focuses on the usability and accessibility of the application. Usability testing evaluates how intuitive the interface is, how easily users can navigate through the application, and how effectively they can complete tasks. Cross-browser testing ensures that the application works consistently across different web browsers and maintains its functionality and appearance. This testing is vital for providing a positive user experience.

7.5 Performance Testing

Performance testing evaluates how the system behaves under various conditions. Load testing measures the system's response times and stability under normal usage conditions, while stress testing pushes the system to its limits to identify potential bottlenecks and failure points. This testing helps ensure that the system can handle expected user loads and maintain acceptable performance levels.

7.6 Security Testing

Security testing focuses on protecting the system and its data. Authentication testing verifies that user login and logout processes work correctly, password policies are enforced, and sessions are managed securely. Authorization testing ensures that users can only access the resources and perform the actions they are permitted to, maintaining proper access control throughout the system. This testing is essential for maintaining system security and protecting user data.

CHAPTER 8

OUTPUT SCREENS / RESULTS

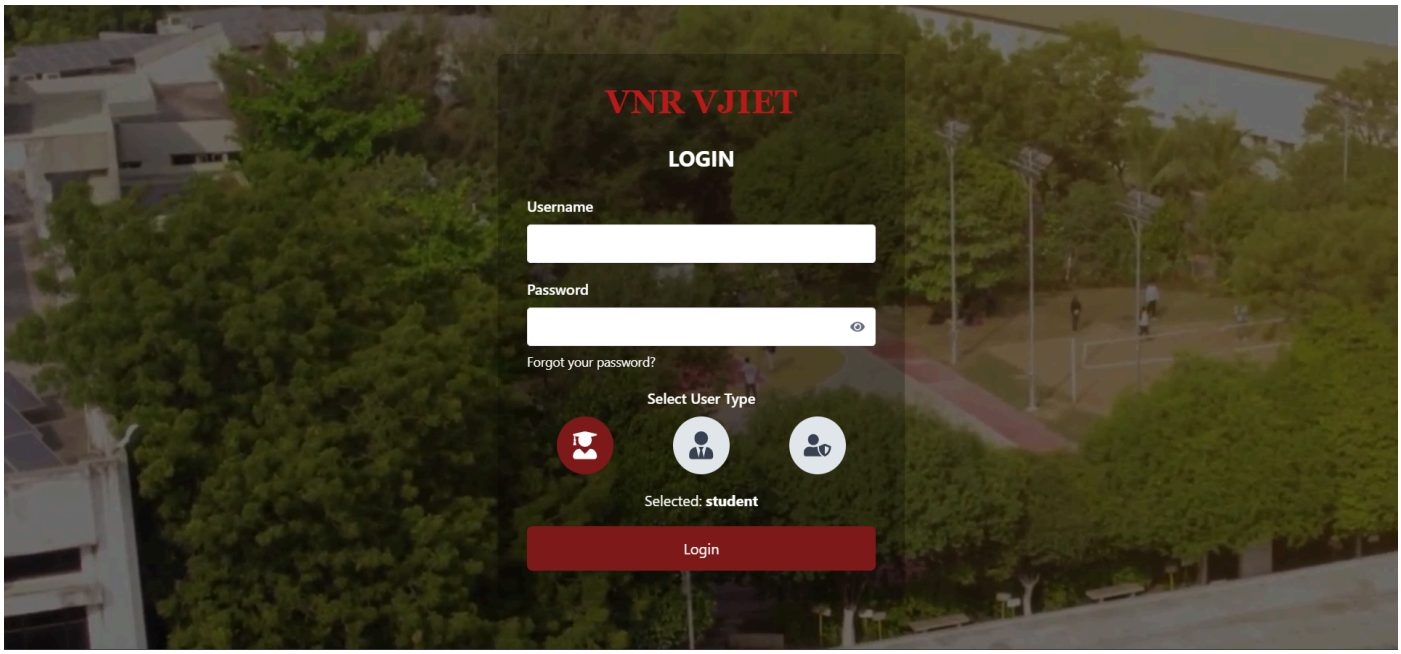

Figure 8.1: Login Page

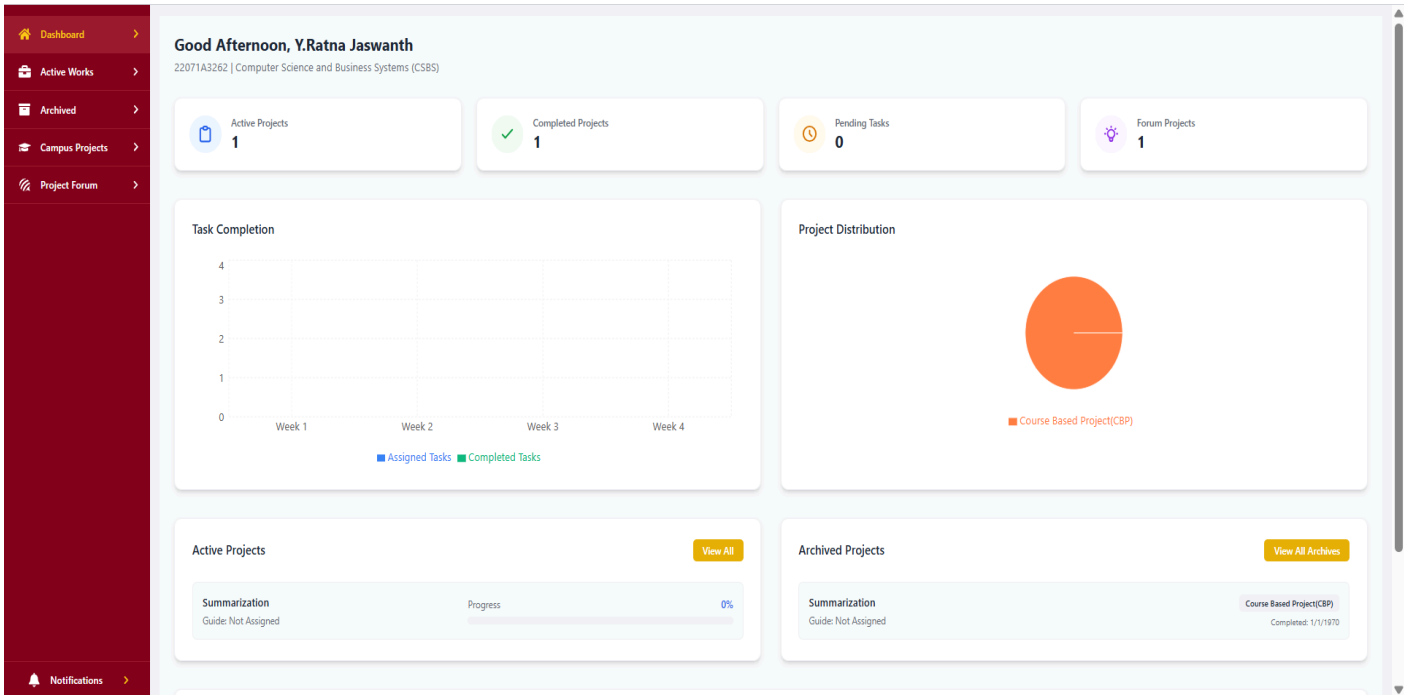

Figure 8.2: Student Dashboard

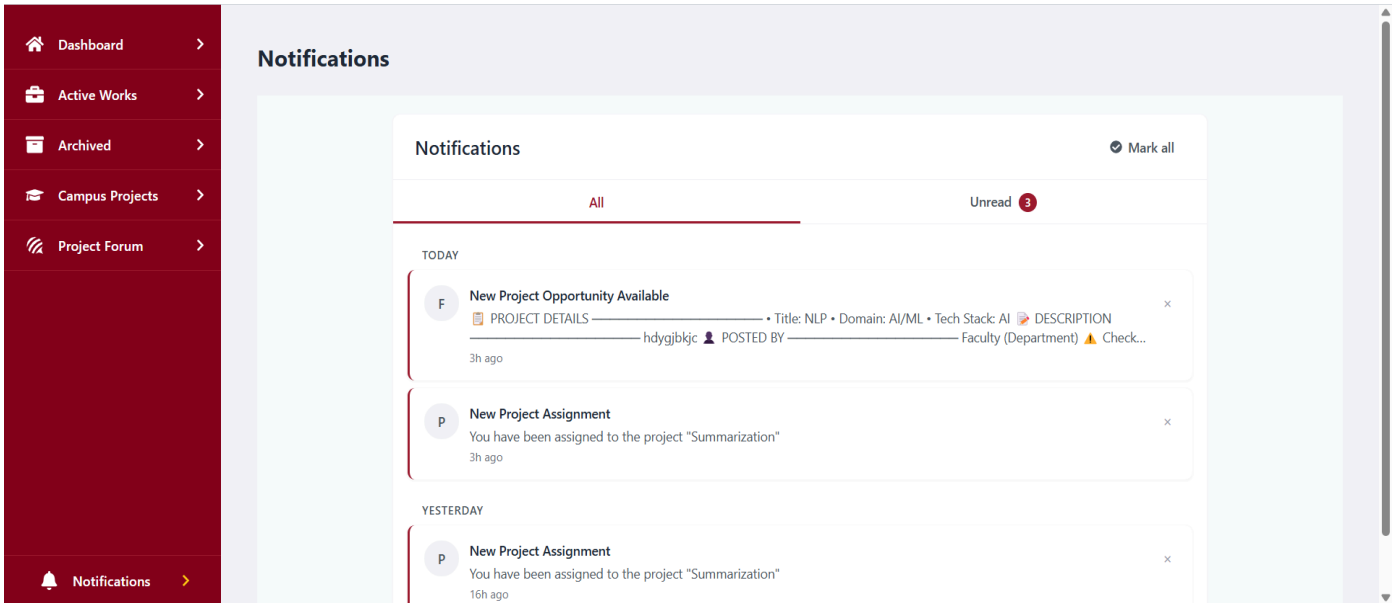

Figure 8.3: Student Notifications

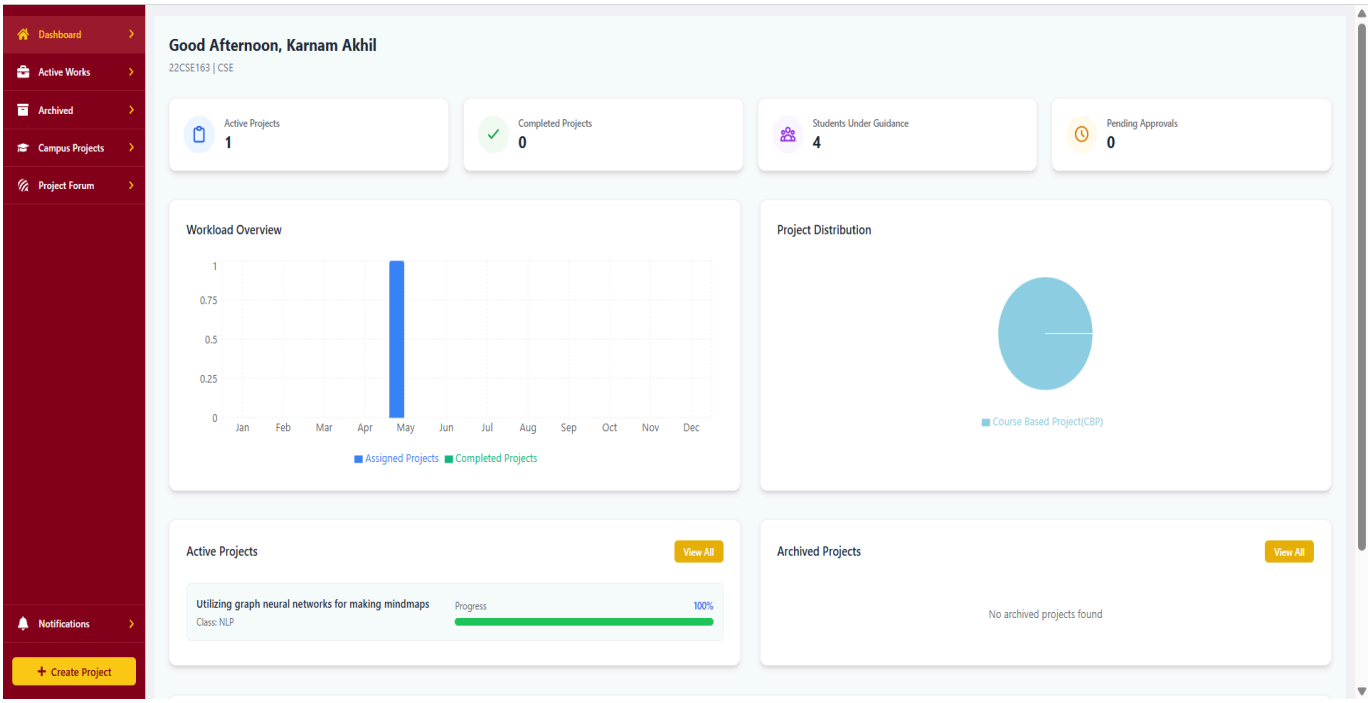

Figure 8.4: Faculty DashBoard

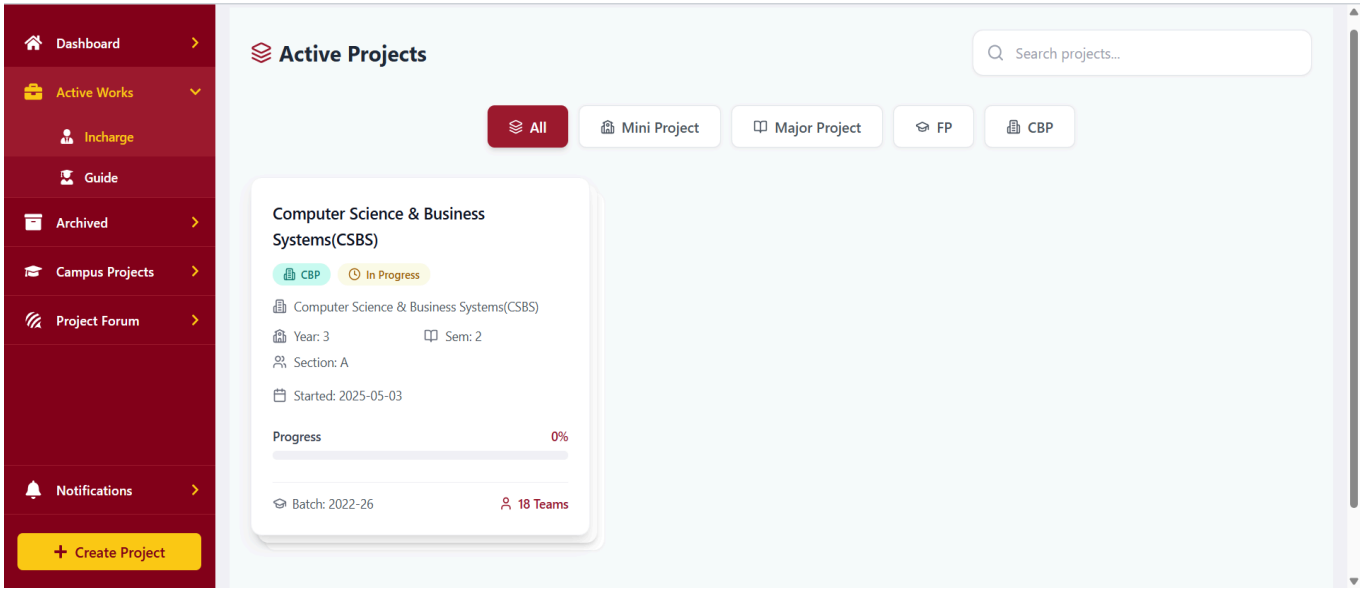

FIgure 8.5: Incharge's Active Works

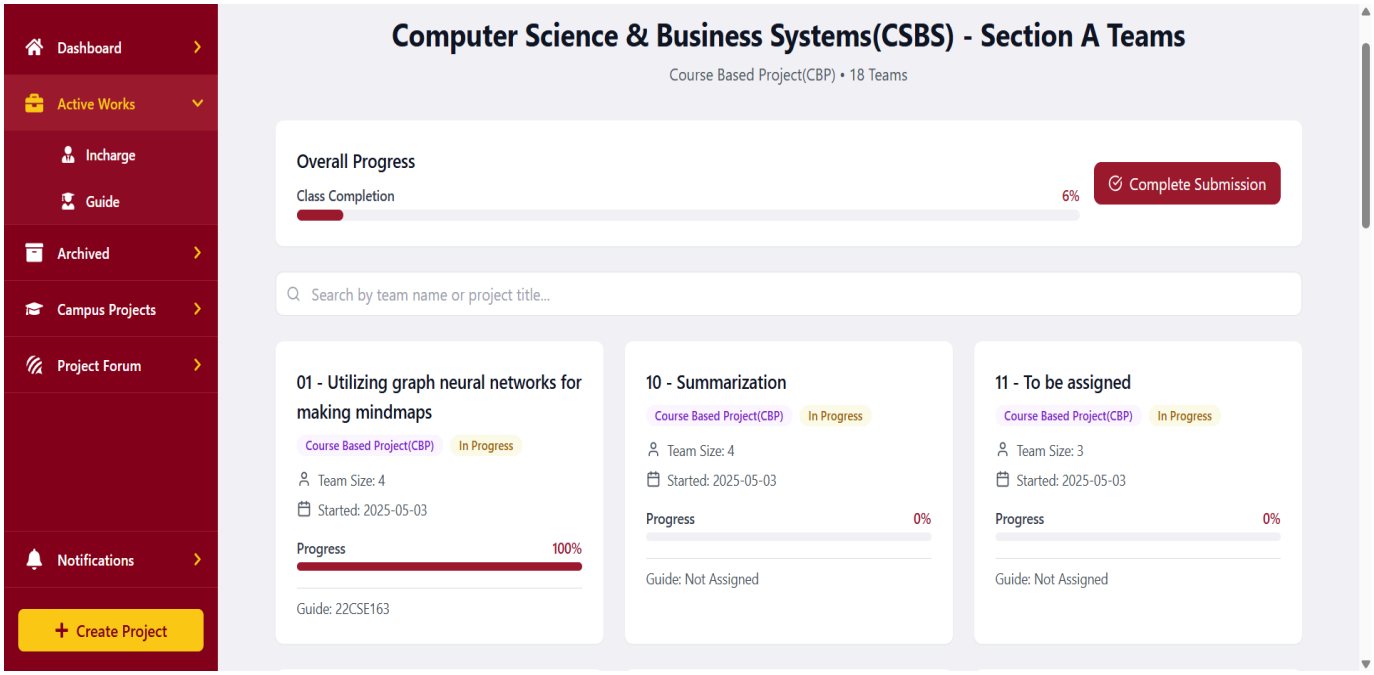

Figure 8.6: Class Details

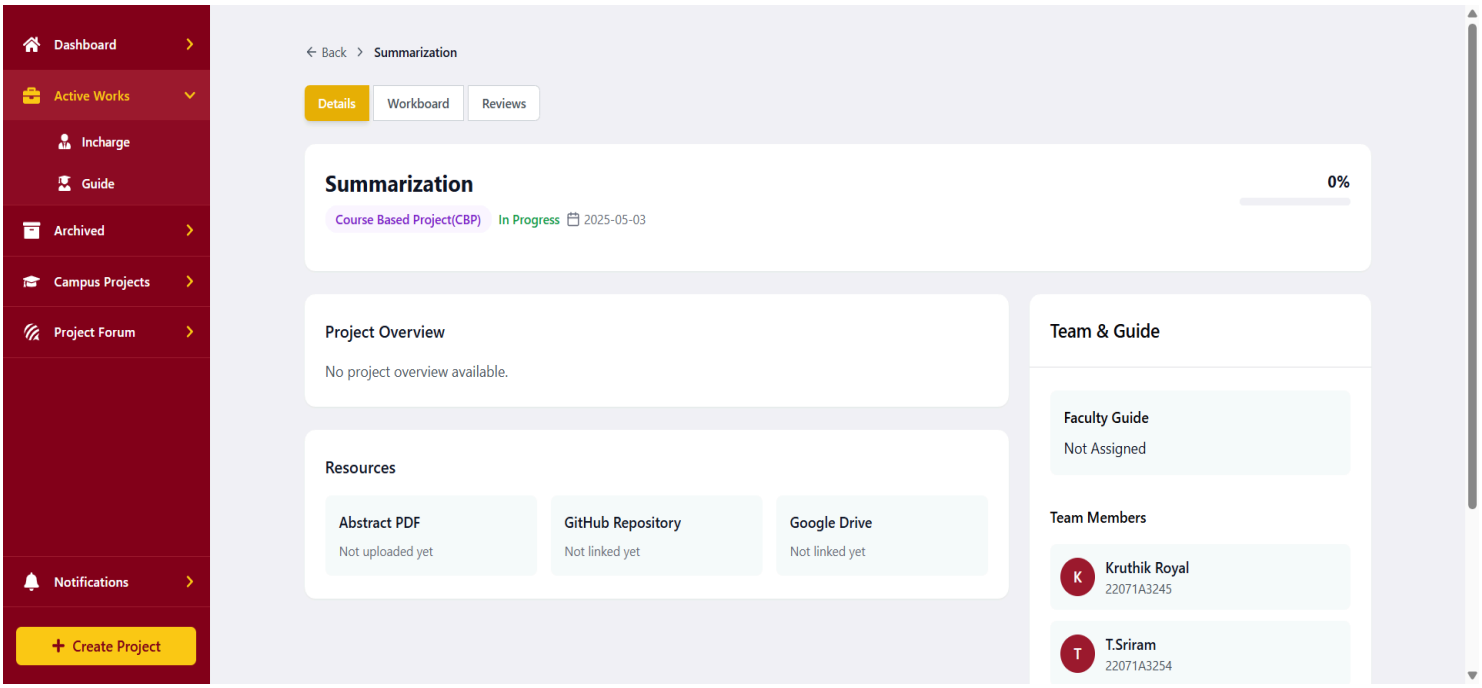

Figure 8.7: Team Details

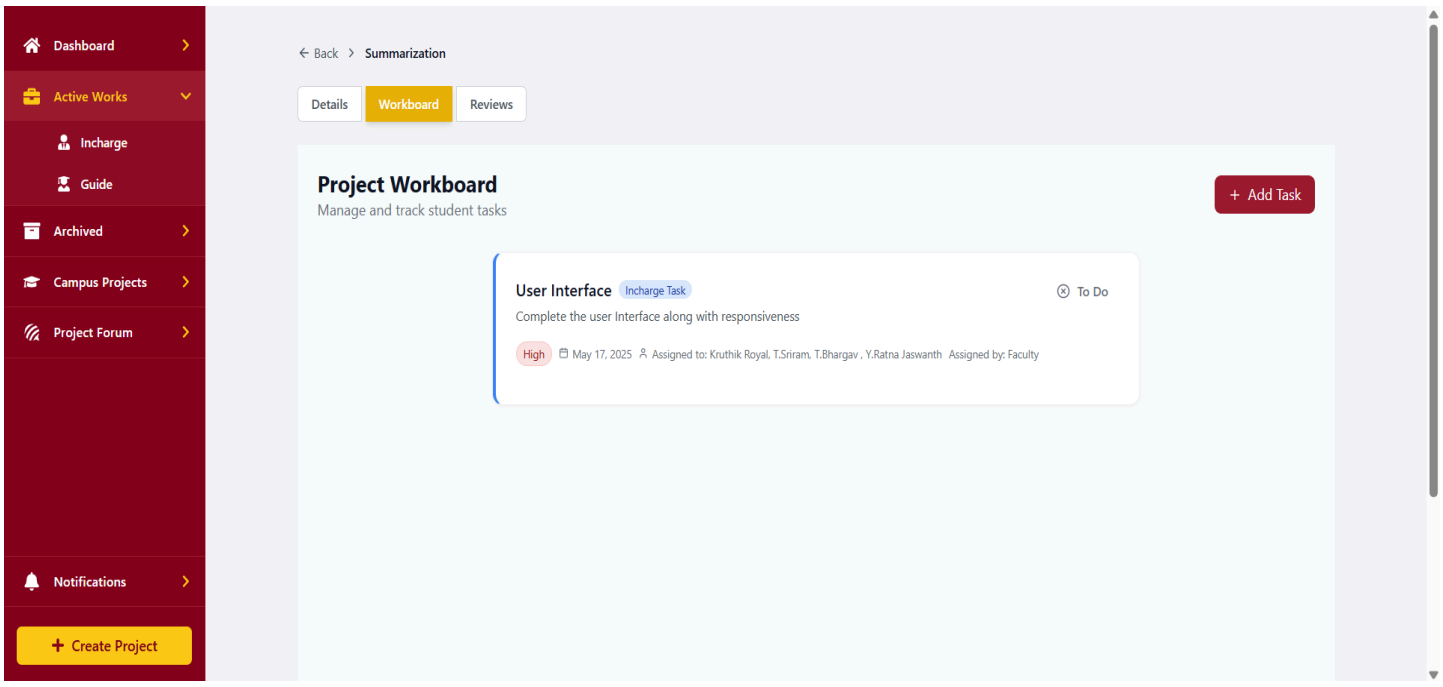

Figure 8.8: Faculty WorkBoard

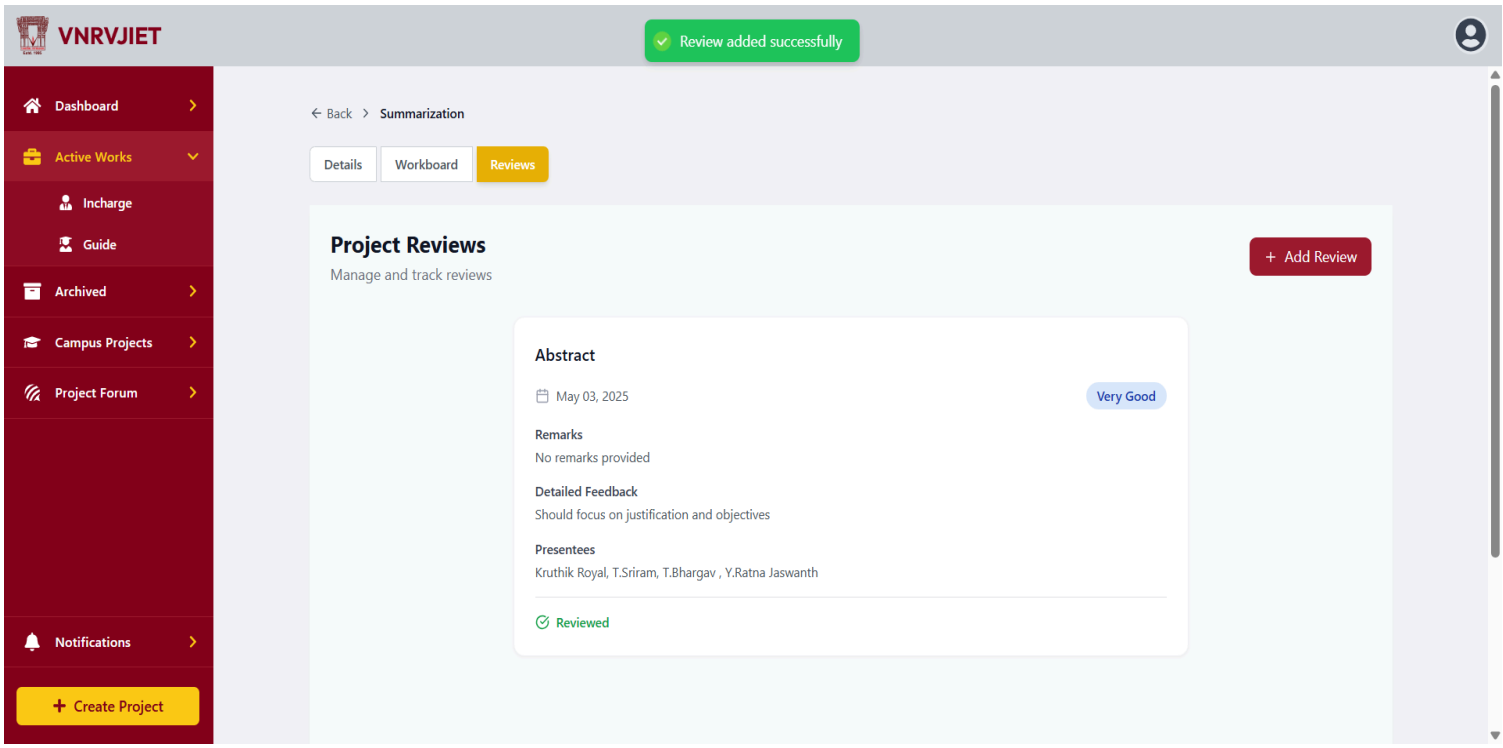

Figure 8.9: Faculty Review Board

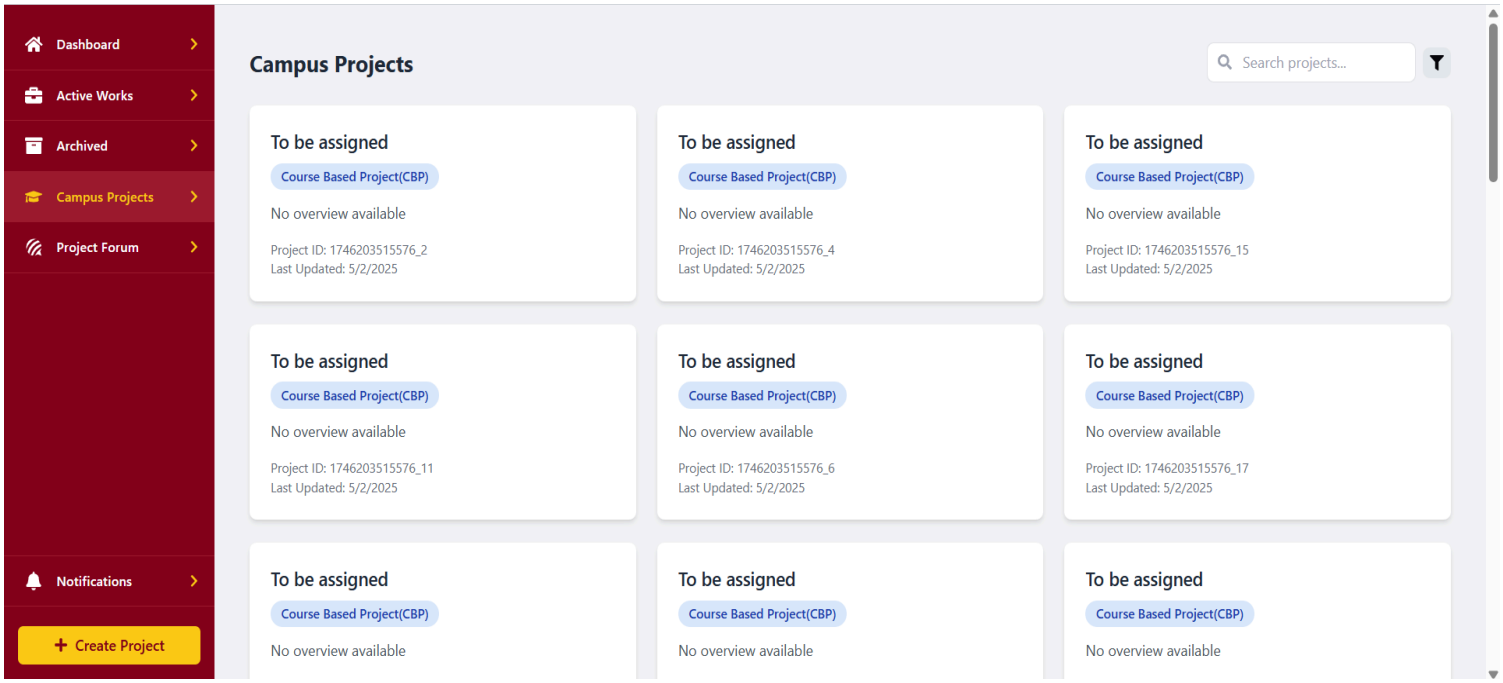

Figure 8.10: Campus Projects

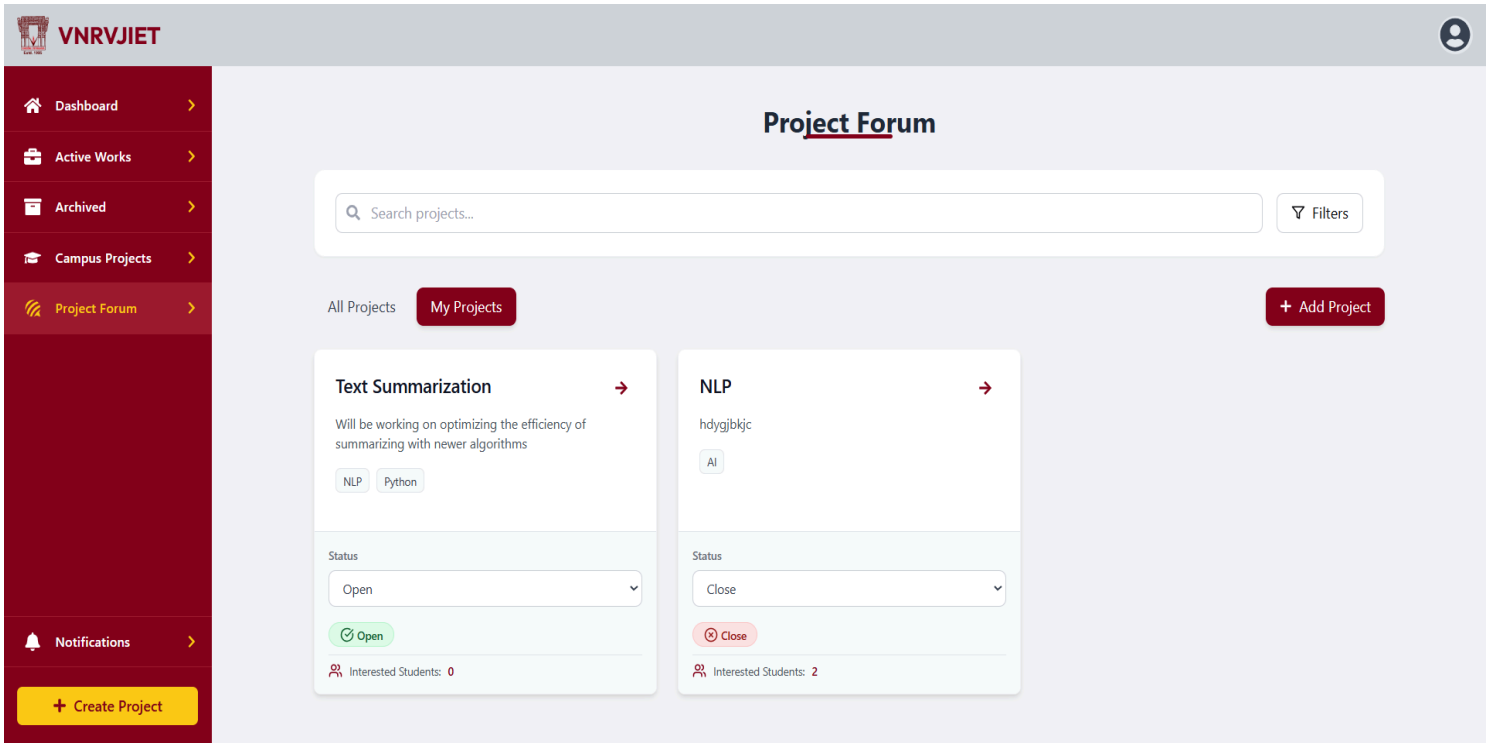

Figure 8.11: Project Forum

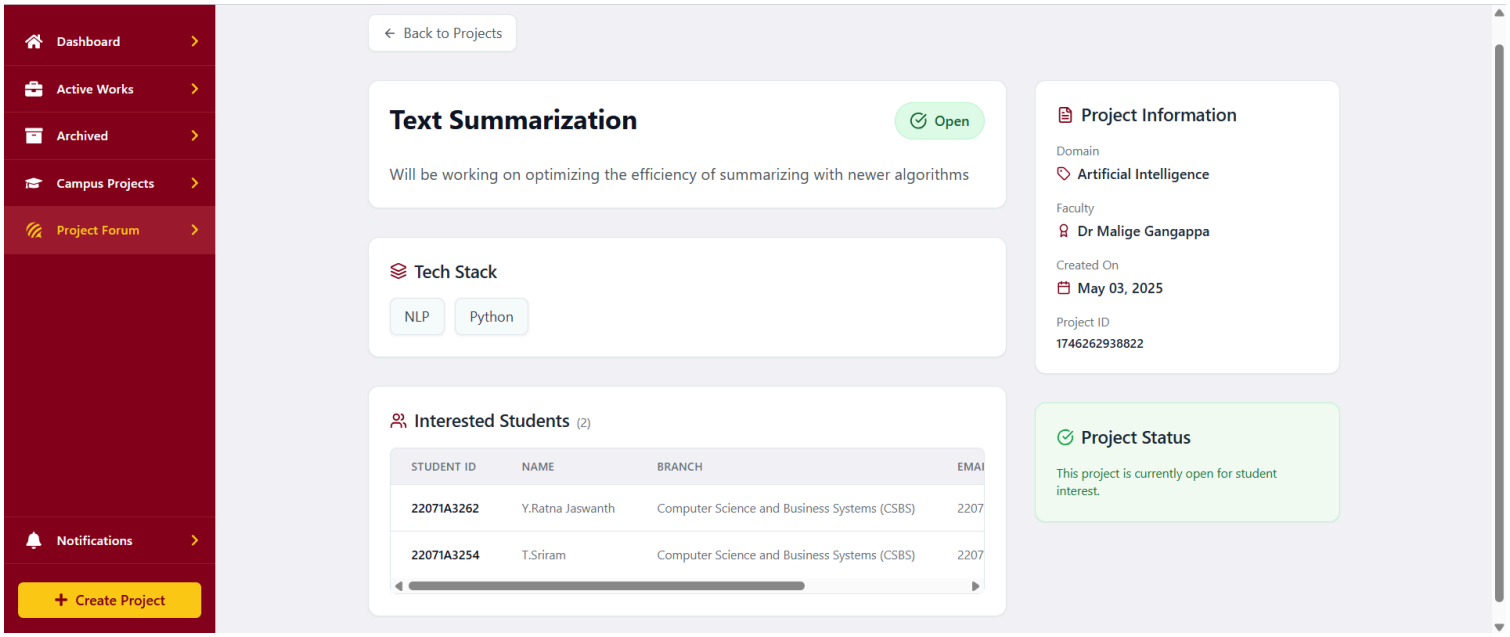

Figure 8.12: Project Forum Details

CHAPTER 9

CONCLUSION AND FUTURE SCOPE

9.1 Conclusion

The proposed system represents a comprehensive and well-structured solution that effectively addresses the current business requirements while maintaining high standards of performance, security, and user experience. Through the implementation of modern web technologies, including React.js for the frontend and a robust backend architecture, the system provides a reliable and efficient platform for users. The modular design approach ensures that components are well-organized and maintainable, while the comprehensive testing strategy guarantees system reliability and performance. The successful implementation demonstrates the effectiveness of contemporary software development practices, including proper state management, secure authentication mechanisms, and responsive design principles. The system's architecture allows for easy maintenance and future enhancements, making it a sustainable solution for long-term use.

9.2 Future Scope

The system's architecture provides a solid foundation for numerous future enhancements and improvements. On the technical front, the implementation of advanced caching mechanisms and WebSocket technology could significantly improve performance and enable real-time features. The adoption of a microservices architecture would enhance scalability and allow for more flexible deployment options. From a feature perspective, the development of mobile applications would extend the system's accessibility, while the integration of artificial intelligence could provide personalized user experiences and advanced analytics capabilities. Security can be further strengthened through the implementation of multi-factor authentication, advanced threat detection systems, and enhanced data encryption mechanisms. The system could also benefit from integration with various third-party services, including payment gateways, IoT devices, and cloud platforms, which would extend its functionality and reach. These future enhancements, while maintaining the system's current modular architecture, would ensure its continued relevance and competitiveness in the market while providing additional value to users and stakeholders.

CHAPTER 10

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