

Kathmandu University
Department of Computer Science and Engineering
Dhulikhel, Kavre



**A Project Report
on
“Kakshya”**

[COMP 311]

(For partial fulfillment of 3rd Year/ 1st Semester in Computer Science)

Submitted by:

**Puja Kadayat (Roll No. 18)
Nikki Kayastha (Roll No. 22)
Siddhant Khadka (Roll No. 24)
Sophiya Khadka (Roll No. 25)**

Submitted to:

**Mr. Nabin Ghimire
Department of Computer Science and Engineering**

Submission Date: 18th June 2024

Bona fide Certificate

This project work on

“.....KAKSHYA.....”

is the bona fide work of

“.....Puja Kadayat, Nikki Kayastha, Siddhant Khadka, Sophiya Khadka.....”

who carried out the project work under my supervision.

Project Supervisor

Mr. Amrit Dahal

Lecturer

Department of Computer Science & Engineering

Date: 18th June 2024

Abstract

Our project is focused on developing a comprehensive school management system website, aimed at enhancing the efficiency of online or offline schooling. Recognizing the challenges students face, our purpose was to create a user-friendly platform that helps students and makes the whole process easier. Leveraging advanced algorithms, our website allows users to keep up with classes, making circulation of notice 10x times easier.

The expected outcome is a transformative shift in the landscape of modern learning, saving student's and teacher's time and effort while elevating their overall experience. In conclusion, our project addresses the exact problem of complicated school environment by offering a user-friendly, efficient solution.

Keywords: *SMS*

Acknowledgements

We extend our heartfelt gratitude to all individuals who guided us in completing this project. We are privileged to express our sincerest appreciation to our project supervisor, Mr. Amrit Dahal, for his invaluable guidance, encouragement, feedback, and constructive criticism throughout the project's duration. We also wish to acknowledge the Department of Computer Science and Engineering (DoCSE) and the entire university for providing us with the opportunity to work on this project.

Sincerely,

Team Kakshya

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Acronyms/Abbreviation

The list of all abbreviations used in the documentation is included here:

ICT	Information and Communication Technology
RAM	Random Access Memory
GUI	Graphical User Interface
UI	User Interface
IDE	Integrated Development Environment
NoSQL	Non-Relational Structured Language

Chapter 1 Introduction

1.1 Background

Student Management Systems (SMS) are essential for educational institutions to improve communication, streamline administrative tasks, and better support students. As student data management becomes more complex and digital tools expand, SMS ensures effective, transparent, and flexible educational operations.



An SMS is a sophisticated software application designed to meet the diverse needs of educational institutions in managing student-related activities. It serves as a centralized platform for storing, organizing, and processing student information, academic records, administrative tasks, and communication among students, teachers, and administrators. This system automates tasks such as registration, attendance tracking, and grading, streamlining administrative processes. By providing easy access to comprehensive student data, an SMS helps administrators and educators make informed decisions and offer personalized support to students.

In summary, a Student Management System is a powerful tool that helps educational institutions optimize operations, enhance communication, and improve student outcomes through efficient data management, streamlined processes, and robust security measures.

1.2 Objectives

The objectives of this projects are:

- To take attendance easily, mark students as present or absent, and generate attendance reports.
- To help students visualize their performance data with interactive charts and tables, enabling them to understand their academic progress at a glance.
- To facilitate effortless communication among users through the system.
- To create a framework that improves student outcomes and enhances the overall educational experience.

1.3 Motivation and Significance

Implementing a Student Management System (SMS) in educational institutions is motivated by the necessity to streamline administrative processes and address the complexities of managing student-related activities. Traditional methods for handling enrollment, attendance, grading, and communication are often inefficient and error prone. By adopting an SMS, institutions can modernize these operations, significantly boosting efficiency and accuracy. Centralizing student information and administrative tasks within an SMS saves time and resources while providing administrators and educators with easy access to comprehensive data. This data-driven approach facilitates informed decision-making and personalized student support, ultimately enriching the overall educational experience.

SMS also plays a crucial role in enhancing communication within the educational community. With features like announcement platforms, SMS promotes collaboration, transparency, and a supportive learning environment. Students, teachers, and administrators can easily share information, and address concerns, leading to increased engagement and satisfaction. Additionally, SMS supports proactive communication regarding important announcements, deadlines, and academic updates, ensuring everyone remains informed and connected.

Moreover, SMS aids in boosting student support and academic outcomes. By providing insights into student performance, attendance, and behavior, SMS helps identify at-risk students who may require additional support or intervention. Early identification of academic challenges allows educators to implement targeted interventions and support strategies to help students succeed. Additionally, SMS generates detailed reports and analytics, fostering transparency and accountability within the educational institution and driving continuous improvement initiatives.

Overall, implementing an SMS optimizes operations, enhances communication, and improves student outcomes, supporting the success of educational institutions in today's dynamic educational landscape.

Chapter 2 Related Works

2.1 Blackbaud



Figure 2.1 Blackbaud Logo

Blackbaud is a software company that helps nonprofits, schools, and other organizations manage their work. They provide tools for fundraising, managing finances, marketing, and more to help these organizations run smoothly and achieve their goals.

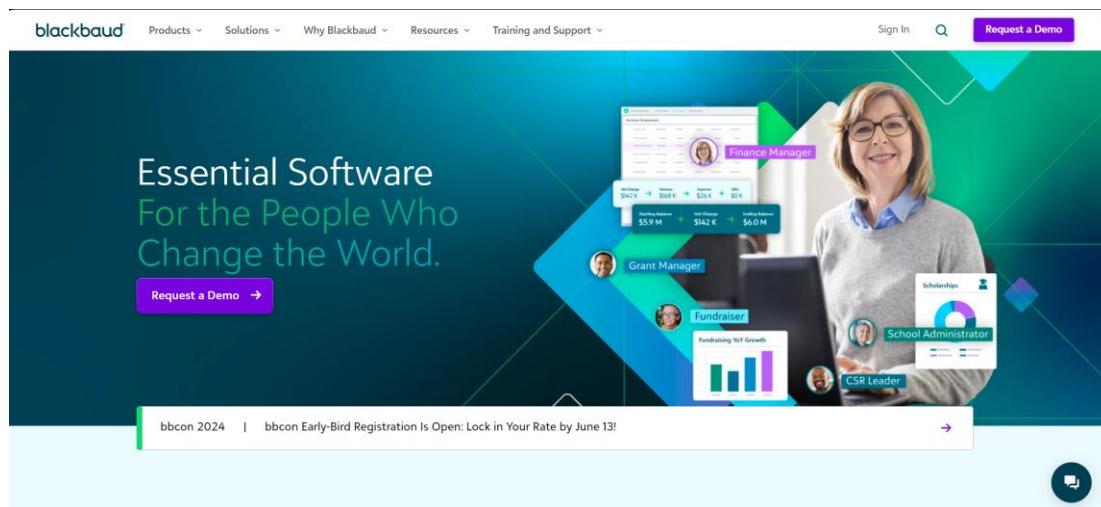


Figure 2.2 Blackbaud Homepage

1. Company Background:

- Blackbaud, founded in 1981, is a leading provider of cloud software solutions for the social good community.

- Headquartered in Charleston, South Carolina, Blackbaud serves nonprofits, educational institutions, healthcare organizations, and faith communities globally.

2. Business Model:

- Blackbaud offers a range of software solutions that help organizations manage fundraising, financials, customer relationships, marketing, and analytics.
- Their platform connects these organizations with tools to streamline operations, enhance donor engagement, and improve overall efficiency.

3. Technology and Innovation:

- Blackbaud utilizes advanced technology to enhance the capabilities of their software solutions.
- The company invests in innovation, data analytics, and cloud computing to provide powerful insights, optimize performance, and ensure data security.

4. Customer-Centric Approach:

- Blackbaud focuses on meeting the unique needs of its customers by providing tailored solutions and excellent customer support.
- Customer feedback is integral to Blackbaud's continuous improvement and development of new features and services.

5. Challenges and Opportunities:

- Blackbaud faces challenges such as cybersecurity threats, evolving technology landscapes, and market competition.
- The company seizes opportunities by expanding its product offerings, exploring new markets, and leveraging emerging technologies to better serve its clients.

2.2 PowerSchool



Figure 2.3 PowerSchool Logo

PowerSchool is an education technology company providing software for schools. Their tools help manage student information, attendance, grading, and

communication between teachers, parents, and

students. PowerSchool's goal is to improve educational experiences by making school administration and student performance tracking easier and more efficient.

A screenshot of the PowerSchool homepage. At the top, there is a navigation bar with links for 'Parents & Students', 'Support', 'Login', and a search bar. The main header features the PowerSchool logo and the tagline 'Personalized Education for Every Journey'. Below the header, there is a photograph of a young girl raising her hand in a classroom setting. To the right of the photo, text reads: 'PowerSchool revolutionizes K-12 with the launch of PowerSchool PowerBuddy™ an AI assistant for everyone in education. Meet PowerBuddy!'. At the bottom, there are three call-to-action buttons: 'Personalize education with Powerschool', 'Explore PowerSchool products & solutions', and 'Sign-in support for students & families'.

Figure 2.4 PowerSchool Homepage

1. Company Background:

- PowerSchool, established in 1997, is a leading provider of education technology solutions.

- Headquartered in Folsom, California, PowerSchool serves millions of students, educators, and administrators globally.

2. Business Model:

- PowerSchool operates a comprehensive platform that offers various tools for student information systems (SIS), learning management systems (LMS), enrollment, special education, and assessment.
- The platform connects educators, students, and parents, providing them with the necessary tools to manage and enhance the educational experience.

3. Technology and Innovation:

- PowerSchool leverages advanced technology to streamline educational processes and improve learning outcomes.
- The company invests in data analytics, cloud computing, and AI to offer personalized learning experiences, efficient administrative operations, and insightful performance analytics.

4. Customer-Centric Approach:

- PowerSchool focuses on customer satisfaction by providing user-friendly interfaces, comprehensive support, and customizable solutions.
- Feedback from educators, students, and parents plays a crucial role in continuously improving the company's products and services.

5. Challenges and Opportunities:

- The education sector faces challenges like budget constraints, rapid technological changes, and diverse educational needs.
- PowerSchool capitalizes opportunities in emerging educational technologies, global expansion, and evolving educational standards to remain a leader in the ed-tech industry.

2.3 Infinite Campus



Figure 2.5 Infinite Campus Logo

Infinite Campus is like a digital hub for schools. It helps teachers, parents, and students keep track of things like attendance, grades, and schedules all in one place. It

makes school life easier by organizing everything you

need to know about school in an easy-to-use app or website. Key features of Infinite Campus include:

Student Information Management: Stores detailed student records including demographics, attendance, grades, and health information.

Gradebook: Allows teachers to input and manage grades and assignments, which can be viewed by students and parents.

Attendance Tracking: Records daily attendance and can generate reports on student absences and tardiness.

Scheduling: Helps in the creation and management of student schedules and class rosters.

Communication Tools: Enables communication between teachers, students, and parents through messaging and notifications.

Parent and Student Portals: Provides access to academic information, schedules, and communication tools for parents and students.

Reporting and Analytics: Offers a variety of reports and data analysis tools to help educators and administrators make data-driven decisions.

Special Education Management: Tracks and manages Individualized Education Programs (IEPs) and other special education requirements.

Health Records: Maintains student health records, including immunizations, screenings, and visits to the nurse's office.

Fee Management: Manages student fees, billing, and payments.

Infinite Campus is designed to improve the efficiency of school operations, enhance communication among stakeholders, and provide timely access to important information. It is widely adopted by school districts across the United States for its comprehensive features and user-friendly interface.

Chapter 3 Design and Implementation

3.1 System Architecture

The online school management system, "Kakshya" was developed using a client-server architecture, comprising a front-end element for user interface and a back-end element for managing data and logic.

3.1.1 System Design

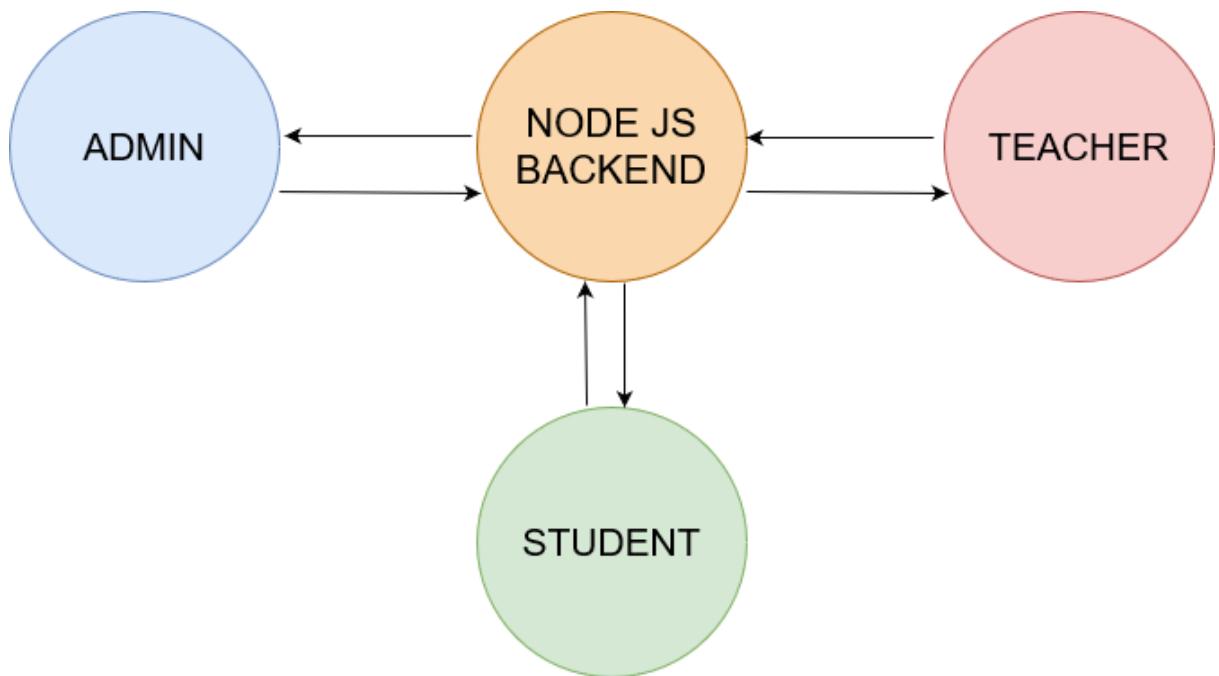


Figure 3.1 System Design

3.1.2 Use Case Diagram:

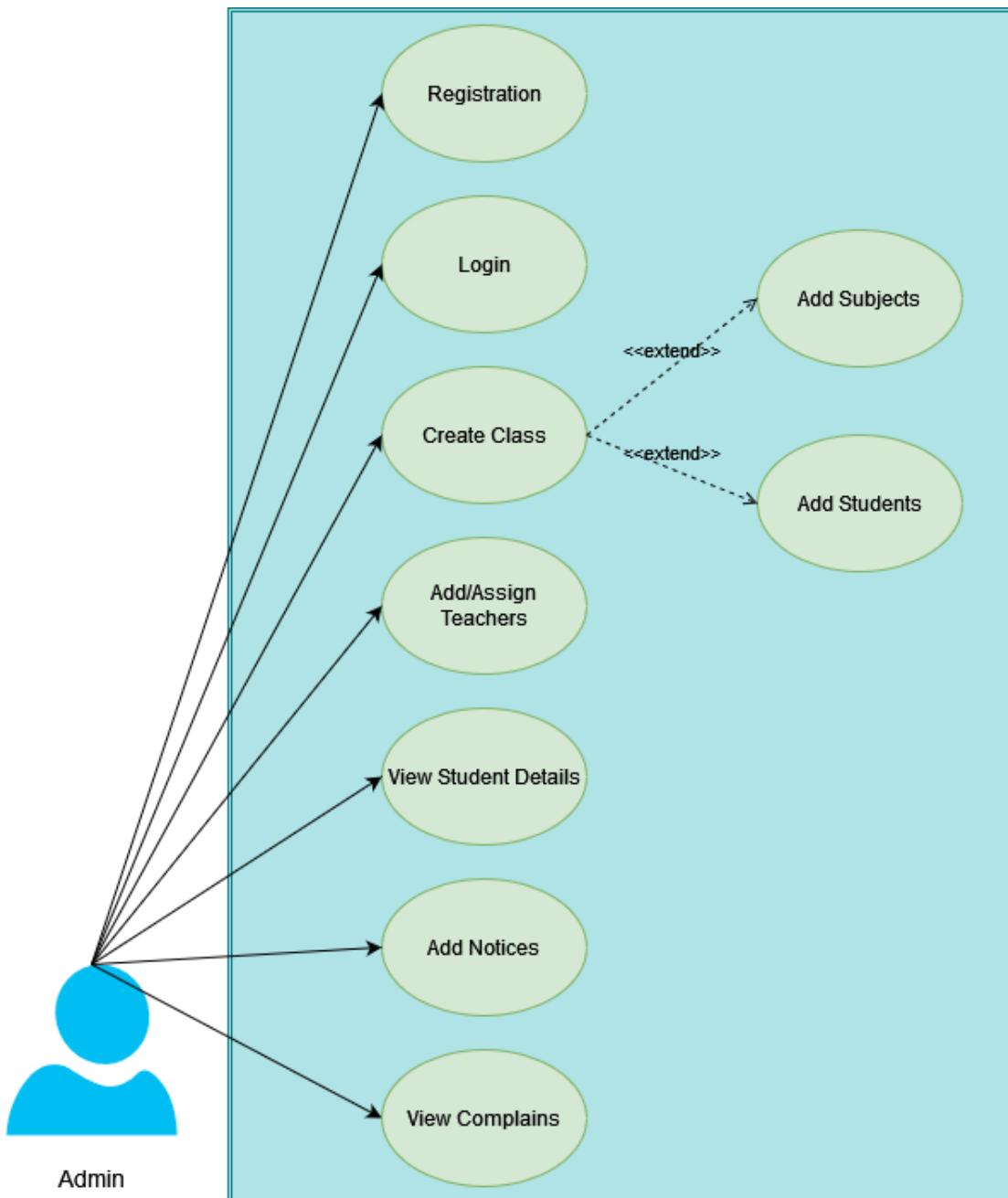


Figure 3.2 Use Case Diagram for Admin

Use case title	Admin Functions
Primary Actor	Admin
Level	Sea level (user goal)
Stakeholders	Admin, Teachers, Students
Precondition	Admin must be logged into the system
Minimal Guarantee	System logs progress until failure; rollback of any uncompleted transaction
Success Guarantees	Admin functions are performed successfully
Trigger	Admin accesses the system
Main Success Scenario	<ol style="list-style-type: none"> 1. Admin registers into the system. 2. Admin logs into the system. 3. Admin creates a class. <ul style="list-style-type: none"> 3a. Admin adds subjects (extends from "Create Class"). 3b. Admin adds students (extends from "Create Class"). 4. Admin assigns teachers to the class. 5. Admin views student details. 6. Admin adds notices. 7. Admin views complaints.
Extensions	<p>3a. Adding subjects</p> <ul style="list-style-type: none"> • 3.a.1. Admin selects the "Add Subjects" option while creating a class. • 3.a.2. Admin inputs the necessary subject details. • 3.a.3. System confirms the subjects are added successfully. <p>3b. Adding students</p> <ul style="list-style-type: none"> • 3.b.1. Admin selects the "Add Students" option while creating a class.

- 3.b.2. Admin inputs the necessary student details.
- 3.b.3. System confirms the students are added successfully.

1a. Registration failure

- 1.a.1. Admin receives an error message indicating registration failure.
- 1.a.2. Admin retries registration.

2a. Login failure

- 2.a.1. Admin receives an error message indicating login failure.
- 2.a.2. Admin retries login.

5a. Viewing student details failure

- 5.a.1. Admin receives an error message indicating the failure to load student details.
- 5.a.2. Admin retries.

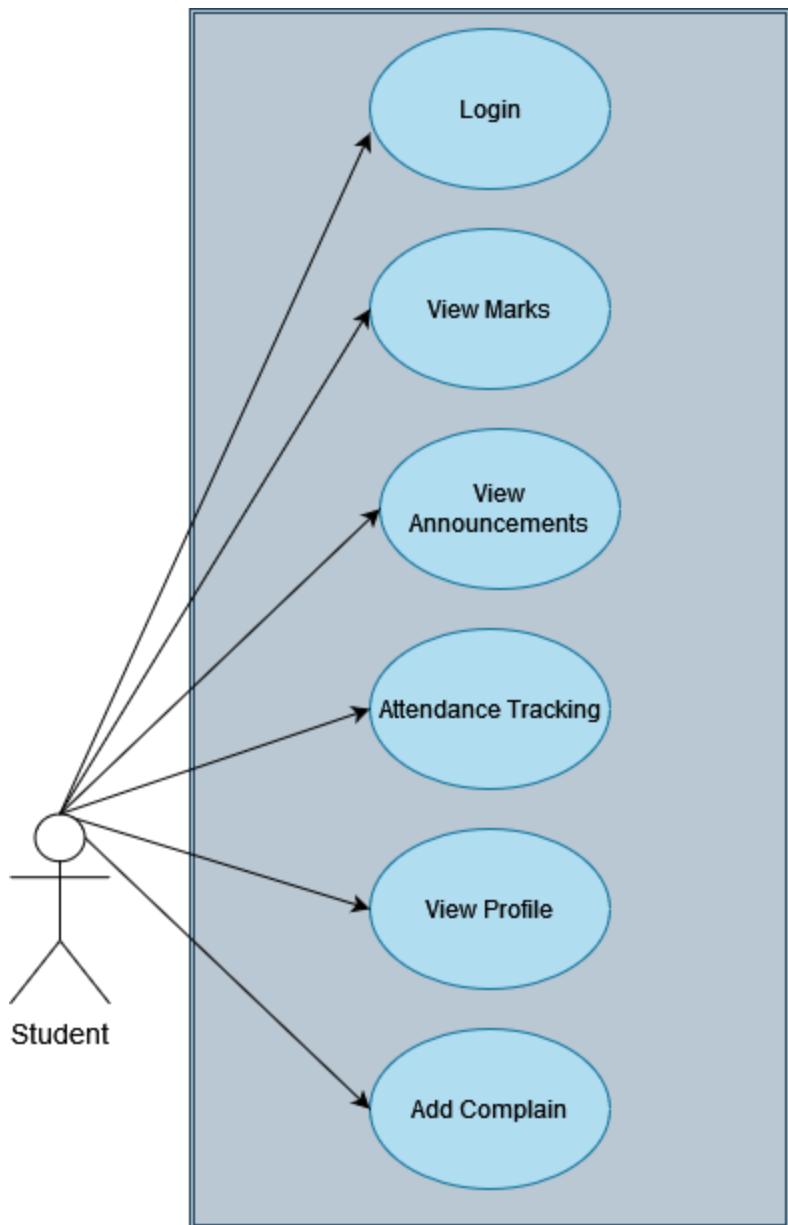


Figure 3.3 Use Case Diagram for Student

Use case title	Student Management
Primary Actor	Student
Level	Sea level (user goal)
Stakeholders	Student, Teachers, Administrators
Precondition	Student must be online with Web access and have valid login credentials.
Minimal Guarantee	Rollback of any uncompleted transaction; system logs progress until failure
Success Guarantee	Information requested by the student is displayed correctly
Trigger	Student accesses the student portal homepage
Main Success Scenario	<ol style="list-style-type: none"> 1. Student logs into the system using their credentials. 2. Student selects "Subject" to see their academic performance. 3. Student selects "Attendance" to view their attendance records. 4. Student selects "Profile" to see their personal and academic information. 5. Student selects "Complaints" to lodge any complaints or issues they have.
Extensions	<p>1a. Login fails.</p> <ul style="list-style-type: none"> • 1a.1. Incorrect credentials are entered; a message prompts the student to try again. <p>2a. Marks data fails to load.</p> <ul style="list-style-type: none"> • 2a.1. Student sees an error message indicating that marks cannot be displayed. • 2a.2. Student refreshes the page and marks data loads successfully. • 2a.3. If the data still does not load, the student is

	<p>advised to check back later.</p> <p>3a. Announcements fail to load.</p> <ul style="list-style-type: none">• 3a.1. An error message is displayed.• 3a.2. The student refreshes the page, and announcements load successfully.• 3a.3. If the announcements still do not load, the student is advised to check back later. <p>4a. Attendance data fails to load.</p> <ul style="list-style-type: none">• 4a.1. An error message is displayed.• 4a.2. The student refreshes the page, and attendance data loads successfully. <p>5a. Profile information fails to load.</p> <ul style="list-style-type: none">• 5a.1. An error message is displayed.• 5a.2. The student refreshes the page, and profile information loads successfully. <p>6a. Complaints cannot be added.</p> <ul style="list-style-type: none">• 6a.1. An error message is displayed.• 6a.2. The student tries to resubmit the complaint.
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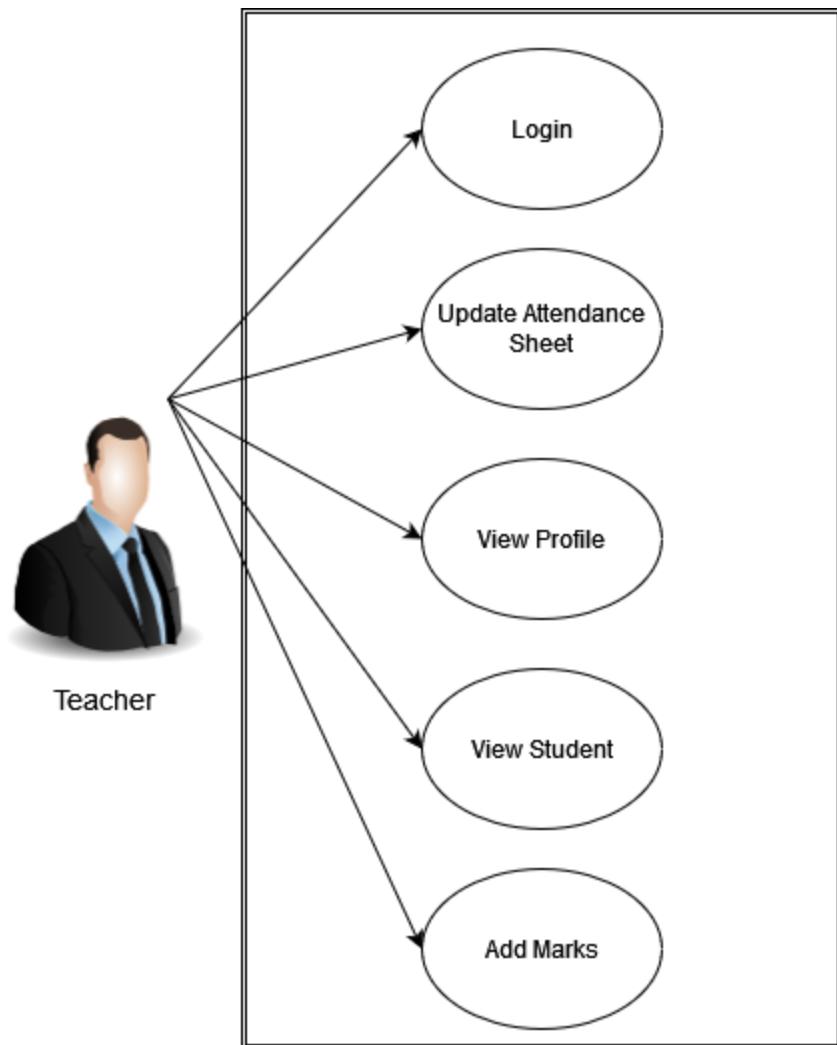


Figure 3.4 Use Case Diagram for Teacher

Use case title	Teacher Functions
Primary Actor	Teacher
Level	Sea level (user goal)
Stakeholders	Teacher, Students, Admin
Precondition	Teacher must be logged into the system
Minimal Guarantee	System logs progress until failure; rollback of any uncompleted transaction
Success Guarantee	Teacher functions are performed successfully
Trigger	Teacher accesses the system
Main Success Scenario	<ol style="list-style-type: none"> 1. Teacher logs into the system. 2. Teacher updates the attendance sheet. 3. Teacher views their profile. 4. Teacher views student details. 5. Teacher adds marks for students.
Extensions	<p>1a. Login failure</p> <ul style="list-style-type: none"> • 1.a.1. Teacher receives an error message indicating login failure. • 1.a.2. Teacher retries login. <p>2a. Update attendance sheet failure</p> <ul style="list-style-type: none"> • 2.a.1. Teacher receives an error message indicating the failure to update the attendance sheet. • 2.a.2. Teacher retries updating the attendance sheet. <p>3a. View profile failure</p> <ul style="list-style-type: none"> • 3.a.1. Teacher receives an error message indicating the failure to load profile details. • 3.a.2. Teacher retries.

	<p>4a. View student details failure</p> <ul style="list-style-type: none">• 4.a.1. Teacher receives an error message indicating the failure to load student details. <p>5a. Add marks failure</p> <ul style="list-style-type: none">• 5.a.1. Teacher receives an error message indicating the failure to add marks.
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3.2 Development Process

The website is written using the MERN (MongoDB, Express, React, Node) stack. MERN describes a specific set of JavaScript-based technologies used in the web application development process.

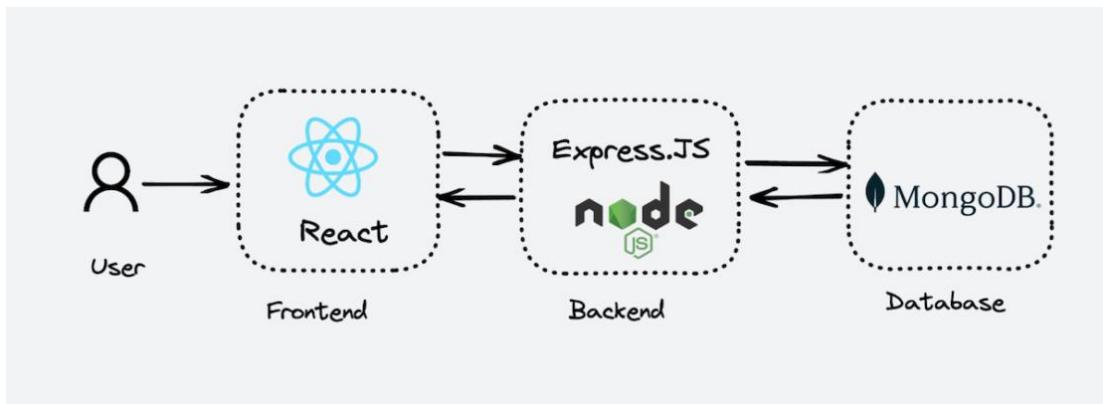


Figure 3.5 Development Process

The above figure shows how the website is designed. During the development of the Kakshya, we followed a sequential procedure that involved 4 stages: Design, Frontend, Backend, and Database. This involved a series of brainstorming ideas for the design which was done using Figma. Then the task was divided into frontend and backend. After the website was completed, we did several rounds of testing to ensure that the website was completely functional and did as it was intended to. Throughout the development process we used a variety of tools and techniques to ensure that that website was of the highest quality and met our objectives.

In the program, we initially created a comprehensive login and sign-up system that includes options for students, teachers, and administrators. The sign-up page allows users to register based on their role, ensuring appropriate access and functionalities tailored to their needs.

Once logged in, users are redirected to their respective dashboards—Student Dashboard, Teacher Dashboard, or Admin Dashboard—where they can manage their activities and access specific features. The project provides a seamless navigation

experience, with each dashboard designed to offer interactive options relevant to the user's role. The project, aimed at simplicity and efficiency, was designed and implemented by a dedicated team, ensuring a robust and user-friendly interface for all types of users. The program is simple and designed using MERN stack.

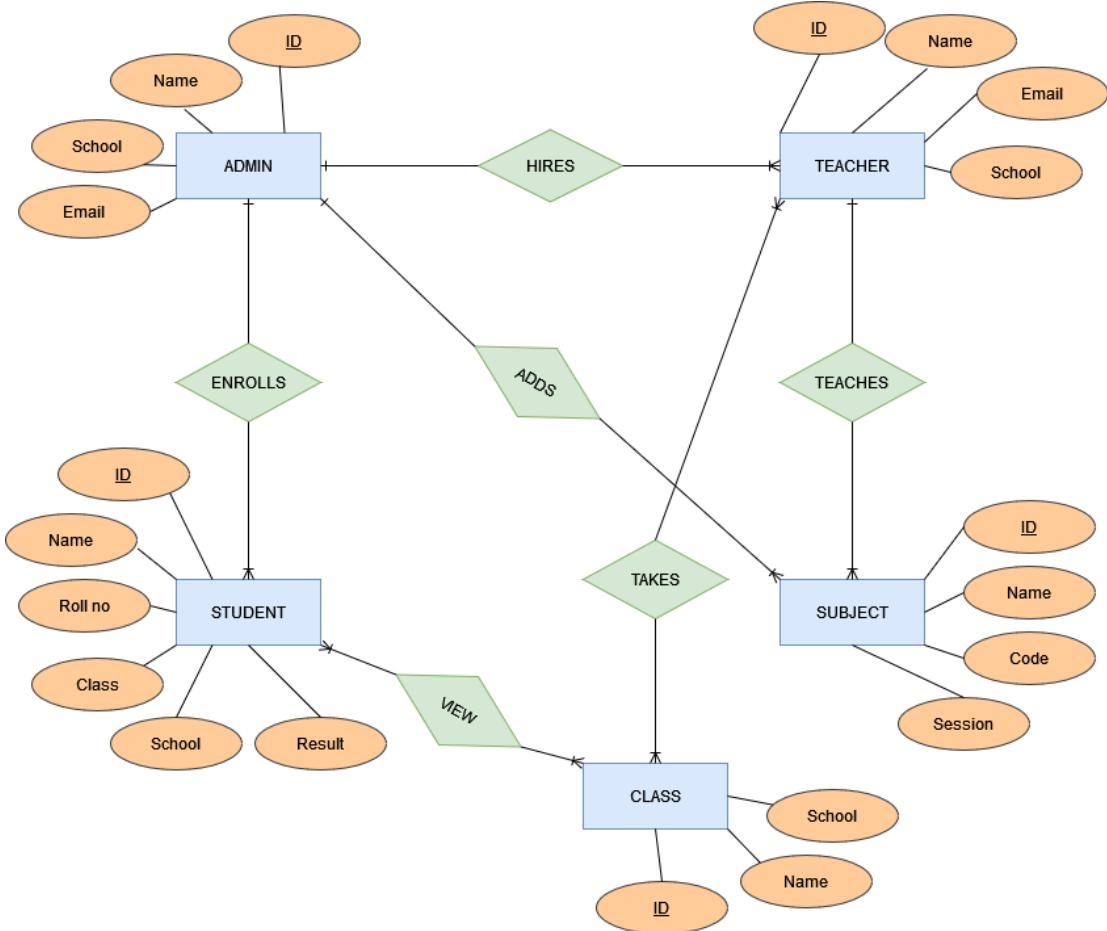


Figure 3.6 ER Diagram

3.3 Frontend

The website's Frontend is built with React and features four primary pages for user interactions. The main components of Kakshya include the login page, the admin dashboard, the student dashboard, and the teacher dashboard. Each dashboard offers unique features enabling users to navigate and interact with various pages.

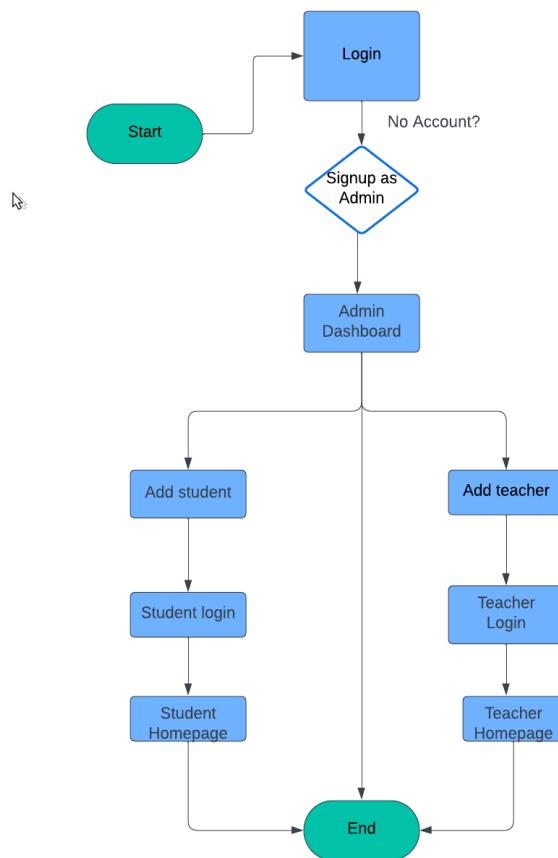


Figure 3.7 Login and main 4 Pages

3.4 Backend

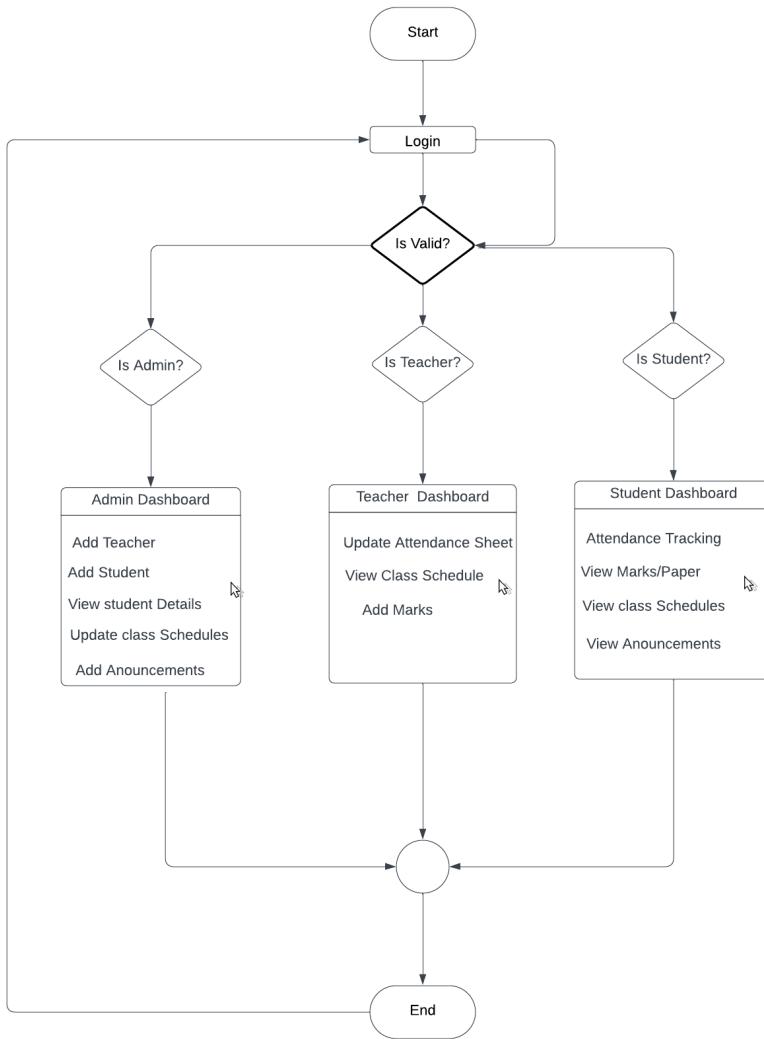


Figure 3.8 Dashboards

Our online school management system, constructed on the MERN (MongoDB, Express.js, React.js, Node.js) stack, boasts a robust backend infrastructure pivotal for delivering essential functionality and managing data effectively. At the core of our backend lies Node.js, which serves as our runtime environment, leveraging its event-driven architecture to handle asynchronous operations with efficiency. Accompanying Node.js is Express.js, a minimalist web application framework providing indispensable tools and middleware for constructing robust APIs and

managing HTTP requests. MongoDB serves as our backend database, offering scalability and flexibility for storing and managing various types of data pertinent to the school management system. Its NoSQL architecture permits easy modeling of complex data structures and adaptation to evolving requirements. Mongoose, a MongoDB object modeling tool for Node.js, facilitates interaction with MongoDB by providing a streamlined approach to defining schemas, executing CRUD operations, and enforcing data validation and business logic.

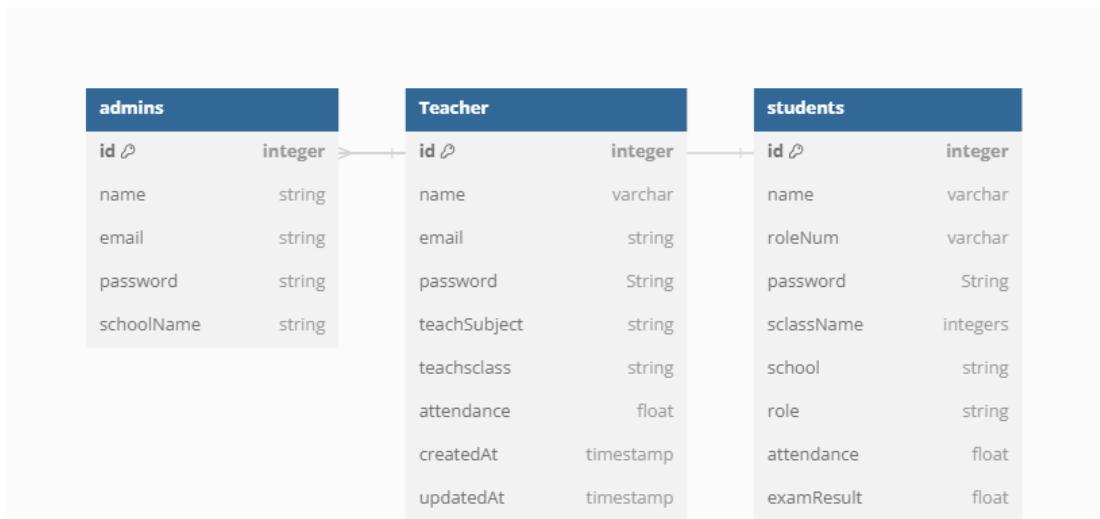


Figure 3.9 Schema Design

In summary, the backend of our online school management system, utilizing the MERN stack, plays a pivotal role in delivering essential functionality, managing data effectively, ensuring security, and providing real-time features necessary for an efficient and user-friendly application.

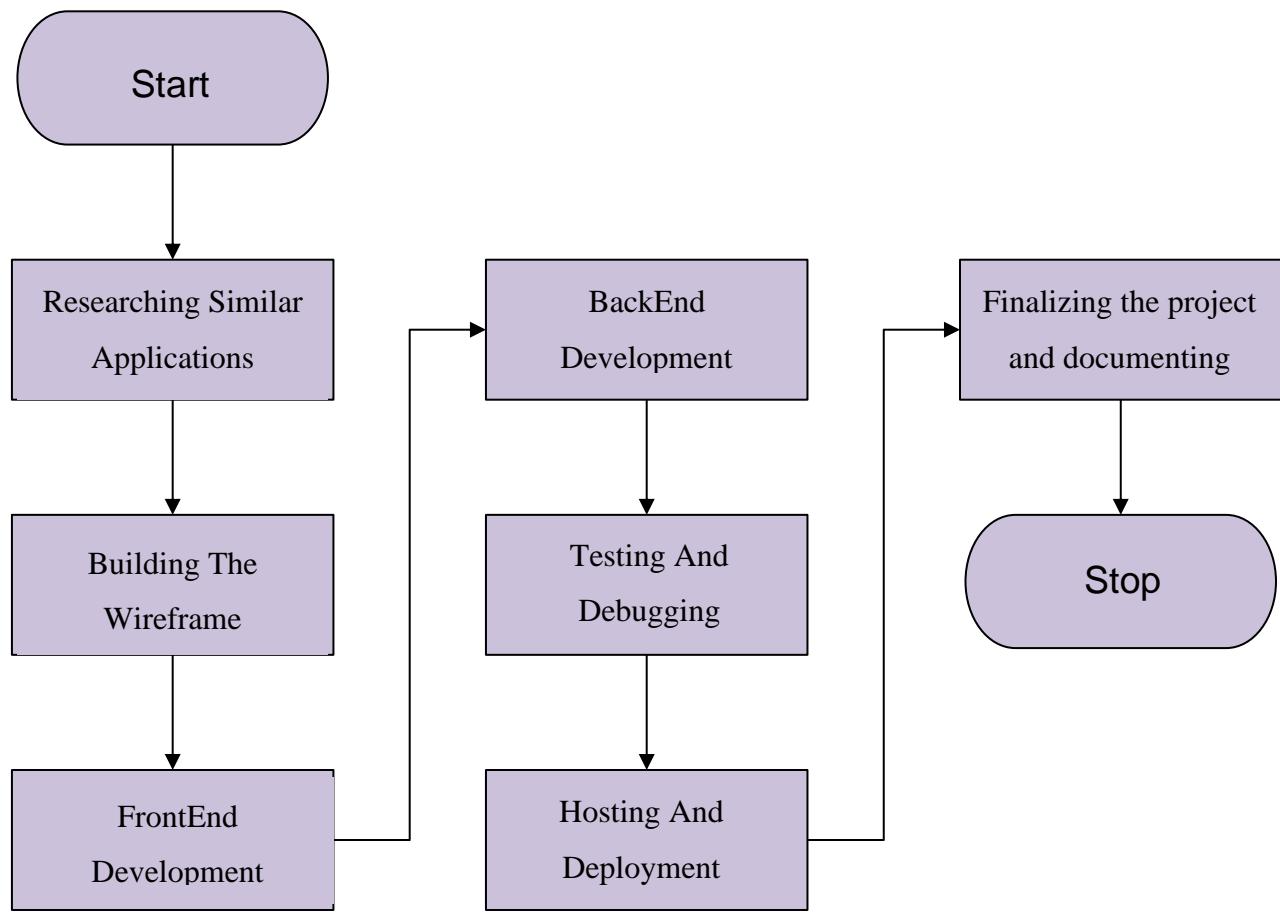


Figure 3.10 Application Development Flow Diagram

3.5 System Requirement Specifications

Software and Hardware specifications:

3.5.1 Software Specifications

- **Operating System:** The system should be compatible with popular operating systems like Windows, macOS, and Linux.
- **Web Browsers:** The system should run on web browsers such as Google Chrome, Mozilla Firefox, and Microsoft Edge.
- **MongoDB:** MongoDB is a NoSQL database that stores data in a flexible, JSON-like format. Its document-oriented structure allows for easy scalability and efficient handling of large volumes of data. MongoDB's flexibility makes it ideal for projects where data structures may evolve over time, and its ability to handle complex queries enables developers to build powerful applications with ease.
- **Express.js:** Express.js is a minimalist web application framework for Node.js. It provides a set of features for building web applications and APIs, including routing, middleware support, and template engines. Express.js simplifies the process of handling HTTP requests and responses, making it easier for developers to create server-side logic for their applications. Its lightweight nature and extensive middleware ecosystem make it a popular choice for building scalable and high-performance web servers.
- **React.js:** React.js is a JavaScript library for building user interfaces. It allows developers to create reusable UI components and manage the state of their applications efficiently. React's component-based architecture promotes code reusability and maintainability, making it easier to build complex user interfaces with ease. Its virtual DOM implementation ensures optimal performance by only updating the necessary parts of the UI when the state changes, resulting in faster rendering times and better user experiences.

- **Node.js:** Node.js is a JavaScript runtime built on Chrome's V8 JavaScript engine. It allows developers to run JavaScript code on the server-side, enabling them to build fast and scalable network applications. Node.js is known for its event-driven, non-blocking I/O model, which allows for highly concurrent and performant applications. Its extensive package ecosystem, provided by npm (Node Package Manager), offers a wide range of modules and libraries to simplify the development process and accelerate time-to-market.
- **IDE, VS Code:** VS Code is a free, open-source code editor developed by Microsoft. It is useful and popular due to its cross-platform nature, intuitive interface, language support, extensions, and integrated terminal.
- **Git:** Version control system for collaborative development.
- **GitHub:** Online platform for hosting and sharing code repositories.

3.5.2 Hardware Specifications

The hardware requirements for the "Kakshya" system are as follows:

Processor: Intel Core i3 or equivalent

RAM: Minimum 2GB

Storage: Sufficient storage space for the application code, databases, and related files

Internet Connection: Stable internet connection for accessing the system.

Chapter 4 Discussion on the achievements

Throughout our collaboration on this project, we had an outstanding experience working together. We encountered various challenges along the way, providing opportunities for learning and enjoyment. Through effective coordination and dedication, we successfully addressed the majority of the obstacles encountered.

4.1 Features and Functionality:

4.1.1 Login Interface:

Users can set up accounts and access the system using their login credentials. This functionality allows for personalized user experiences.

4.1.2 Information Management:

Centralized student details like contact information, academic records and attendance. It also provides profiles for teachers with contact details and subjects taught.

4.1.3 Attendance Tracking:

This feature automates the process of tracking student attendance, providing real-time data on who is present and who is absent, which is crucial for monitoring and maintaining attendance records accurately.

4.1.4 Communication Tool:

This feature provides communication channels such as messaging systems that enable communication between students, teachers, and administrators, fostering collaboration and engagement through notices and complain tabs.

4.1.5 Gradebook and Progress Tracking:

It offers a digital gradebook where teachers can record and track student grades, which gives overall academic progress, providing a clear overview of each student's performance.

4.1.6 Classroom management:

It allows administrators to create and assign teachers to classes, allocate classrooms, and ensure smooth functioning of the academic calendar.

4.1.7 Security Controls

This feature ensures the security and privacy of sensitive data by implementing measures such as role-based access control, user authentication, and encryption of data, protecting the system from unauthorized access and data breaches.

Chapter 5 Conclusion and Recommendation

Working at Kakshya has been an incredible experience where we gained valuable insights into designing functional web applications, covering everything from the design process to backend development. Our primary objective was to create a user-friendly, minimalist online school management system (SMS). In conclusion, our experience with the MERN stack for building our online school management system has been positive. We found it to be efficient, flexible, and conducive to creating a user-friendly interface. Challenges arose, particularly in optimizing performance and implementing features, but these provided valuable learning opportunities. Moving forward, continuous improvement and iteration should be carried out to refine functionality and enhance user experience. Overall, we are proud of the application we've developed and its potential to streamline school operations effectively.

5.1 Limitations

Despite the tremendous effort we've invested in bringing this project to fruition within a tight timeframe, we recognize that due to time constraints, limited knowledge, and resource constraints, there is still ample opportunity for improvement in our work, ranging from minor to significant enhancements.

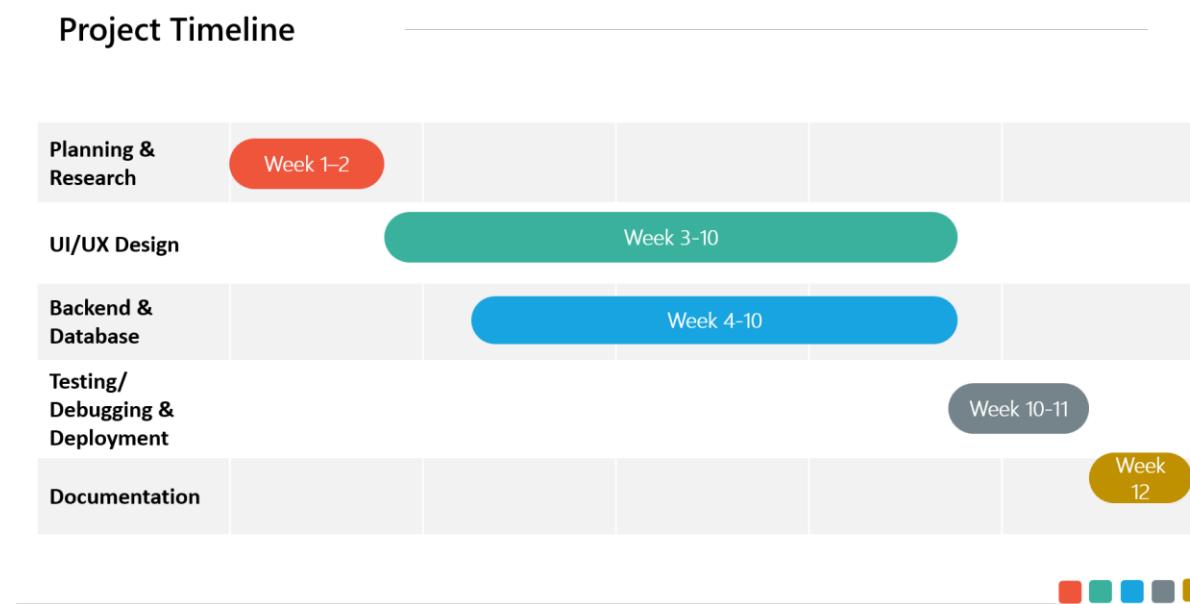
- **Performance and Scalability:** Depending on the system's current architecture and infrastructure, it might face limitations in terms of performance and scalability. As the number of users and appointments increases, the system may experience slowdowns or other performance issues. Optimizing the system's performance and scalability can help handle a larger user base and increasing demand.
- **Internet Dependency:** It relies on internet connectivity. If the internet is down or slow, it may hinder access to the system, affecting administrative tasks and communication.

- **Resources Distribution:** Due to cloud storage demands, we couldn't integrate the resources distribution system. The resources such as documents, images, PDFs uploaded through teachers to their respective classrooms would have been highly beneficial to the students.

5.2 Future Enhancement

- **Performance Enhancement:** With the growth in the user base, it will become crucial to enhance the system's performance. Potential future improvements may concentrate on enhancing system responsiveness, decreasing loading durations, and streamlining server-side operations to effectively manage a higher influx of requests.
- **Mobile App Development:** Developing dedicated mobile applications for the school management system will improve accessibility, convenience, and user experience for students, parents, teachers, and administrators.
- **Gamification Elements:** Introducing gamification elements such as badges, leaderboards, and rewards will increase student engagement, motivation, and participation in learning activities.
- **Remote Learning Support:** To Enhance support for remote learning environments, we can include features such as virtual classrooms, online assessments etc.

Gantt Chart



References

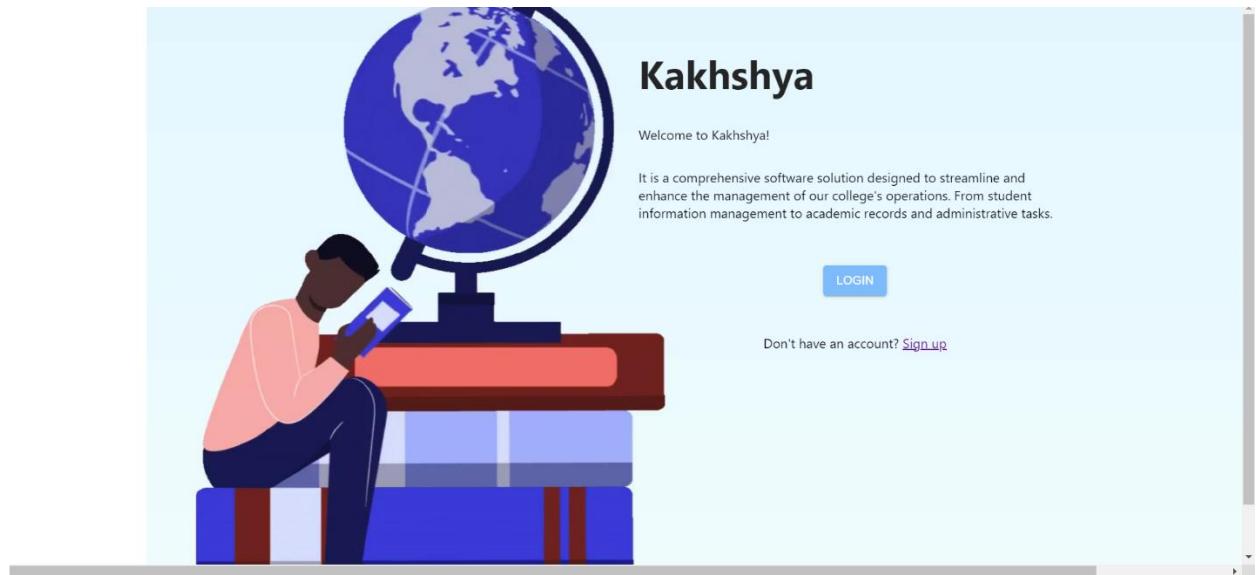
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APPENDIX



Homepage

The screenshot shows the Admin Dashboard. The left sidebar contains icons for Home, Classes, Students, Teachers, Notices, and Log Out. The main area has three summary cards: "Total Students" (4), "Total Classes" (3), and "Total Teachers" (1). Below this is a section titled "Notices" which lists one item: "HOLIDAY" with the details "Hello 8th may is a holiday!" and the date "2024-05-08". At the bottom right of the dashboard, there are pagination controls: "Rows per page: 5" and "1-1 of 1".

Admin Dashboard

Student Dashboard

P

- Home
- Subjects
- Attendance
- Complain

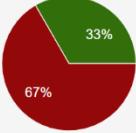
User

- Profile
- Logout



Total Subjects

1



Notices

Title	Details	Date
HOLIDAY	Hello 8th may is a holiday!	2024-05-08

Rows per page: 5 ▾ 1-1 of 1 < >

Student Dashboard

Teacher Dashboard

D

- Home
- Class CS 2021
- Complain

User

- Profile
- Logout



Class Students

3



Total Lessons

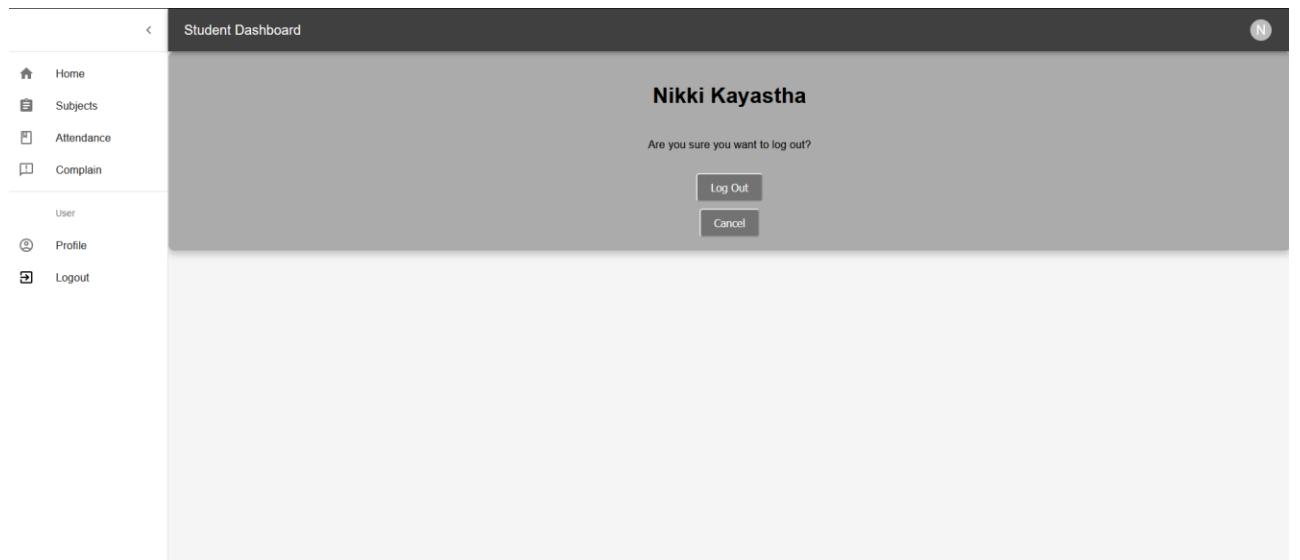
3

Notices

Title	Details	Date
HOLIDAY	Hello 8th may is a holiday!	2024-05-08

Rows per page: 5 ▾ 1-1 of 1 < >

Teacher Dashboard



Logout Page