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Design and Development of a Web-Based College Enterprise Resource Planning (ERP) System for Academic and Administrative Management

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Abstract: ***A web-based program called the College ERP System was created to automate and manage academic tasks at colleges. It facilitates the completion of duties by teachers, administrators, and students using a single, centralized system. The administrator can make schedules, keep track of attendance, and handle teacher and student information. Teachers are able to submit study materials for students and record attendance. Through the system, students can access their notes and see their attendance. React, Flask, and MySQL are used in the development of the application to guarantee effective data management. College administration is made simpler and more structured by this system, which also decreases manual labor and increases accuracy.***

Keywords: College ERP System, Web Application, Student Management, Faculty Management, Attendance Management, Timetable Management, React, Flask, MySQL, Role-Based Access Control.

I. INTRODUCTION

Effectively handling academic and administrative tasks has become crucial for colleges and universities in the current educational system. The majority of traditional techniques for keeping track of student data, attendance, schedules, and study materials are labor-intensive and manual. Errors, data loss, and trouble obtaining information when needed are common outcomes of these manual systems. As technology advances, educational institutions are shifting to digital solutions to enhance their administrative procedures. The purpose of a college ERP (Enterprise Resource Planning) system is to combine and automate several college functions onto a single platform. It facilitates the efficient management of student data, faculty information, attendance records, and academic timetables. For administrators, instructors, and students, the College ERP System offers role-based access, guaranteeing that each user may carry out particular duties in accordance with their obligations. The administrator can make schedules, keep an eye on attendance records, and manage student and faculty data. Teachers are able to submit study materials for students, monitor their timetables, and record attendance. Students can see faculty-uploaded notes and verify their attendance by logging into the system. This method guarantees transparency in academic activity and enhances communication between all users. Modern web technologies including MySQL for database administration, Flask for the backend, and React for the frontend are used in the development of the application.

A. Background and Motivation

Academic and administrative tasks like keeping track of student records, faculty information, attendance, and schedules are frequently managed via manual or semi-digital systems in many educational institutions. These conventional techniques require a lot of time, are prone to human mistake, and complicate data administration. Decision-making may be delayed by the inefficiency of retrieving information from dispersed files or paper records. A more effective and automated approach is desperately needed to manage these operations given the speed at which technology is developing and the growing number of college students. The College ERP System was created with the intention of offering a digital, centralized platform that makes academic process management easier.

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B. Problem Statement

Academic and administrative tasks like keeping track of student records, faculty information, attendance, and schedules are frequently managed via manual or semi-digital systems in many educational institutions. These conventional techniques require a lot of time, are prone to human mistake, and complicate data administration. Decision-making may be delayed by the inefficiency of retrieving information from dispersed files or paper records. A more effective and automated approach is desperately needed to manage these operations given the speed at which technology is developing and the growing number of college students. The College ERP System was created with the intention of offering a digital, centralized platform that makes academic process management easier.

C. Objectives

The following are the main goals of the suggested system:

1) To develop a web-based College ERP System that manages academic and administrative activities efficiently.
2) To automate student and faculty management, reducing manual paperwork and errors..
3) To implement role-based access for Admin, Faculty, and Students for secure system usage.
4) To provide an attendance management system where faculty can record and students can view attendance.
5) To enable timetable management and study material sharing through a centralized platform.
6) To improve efficiency, data accuracy, and accessibility in college management using modern web technologies.

The remainder of this paper is organized as follows: Section II Literature Survey, Section III describes the Proposed Methodology, Section IV explains the Evaluation and Results,Section V details the Discussion, Section VI presents results and discussion, and Section VII concludes the paper with future research directions.

II. LITERATURE SURVEY

A literature survey is conducted to investigate existing systems, technologies, and research relevant to college management systems and ERP solutions. It aids in comprehending existing methods, spotting weaknesses, and creating a better system. The College ERP System project's literature review was conducted using the following procedures.

A. Identification of the problem statement

The administration of academic and administrative tasks in educational institutions is the College ERP System's problem domain. For duties including keeping track of attendance, managing faculty information, creating schedules, and preserving student data, many universities still rely on manual or somewhat digital systems. These conventional techniques frequently result in inaccuracies, redundant data, and trouble retrieving or changing information. It is also difficult for administrators to effectively monitor academic activity in the absence of a centralized system. While students might not have easy access to their academic information and study resources, faculty members might have trouble keeping track of and registering attendance. A centralized, automated system that can effectively manage these procedures is therefore required. In order to solve this issue, the College ERP System offers a web-based platform that combines various modules into a single system, including teacher management, student management, attendance monitoring, and study material sharing.

B. Collection of Relevant Information

Data on college administration procedures was gathered from a variety of sources in order to compile pertinent information for the College ERP System project. Information was gathered by examining the manual systems that are already in use at educational institutions to handle schedules, attendance, faculty information, and student records. Understanding the typical difficulties encountered in preserving and obtaining academic knowledge was aided by conversations with instructors and students. Research papers, internet sites, and documentation pertaining to web-based applications and ERP systems were the sources of additional knowledge. Technical details concerning technologies like MySQL, Flask, and React were also examined to see how they could be applied to create an effective solution.

C. Study of Existing Systems

Many institutions continue to handle academic and administrative tasks using manual or partially automated techniques, according to an analysis of current systems. These systems frequently store data in registers, files, or distinct databases kept by several departments, including student records, faculty information, attendance, and schedules.

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Data entry, updating, and record keeping in this process take a lot of time and human labor.-based systems are effective, small businesses might not be able to pay or use them. Data duplication, human entry errors, and slow information retrieval are just a few of the issues that current systems must deal with. The lack of a centralized platform for data storage results in ineffective.

D. Requirement Analysis

In order to determine the needs and expectations of the users, requirement analysis is a crucial stage in the development of the College ERP System. At this point, the needs of instructors, administrators, and students were thoroughly examined to determine what the system should be able to do. Administrators must be able to handle teacher and student information, make schedules, and keep track of attendance. It should be possible for faculty members to post study materials for students, view their timetables, and record attendance. Through a secure login, students should be able to access their study materials and attendance data. To effectively store and handle all data, the system also needs a centralized database. To guarantee seamless functioning, security, an intuitive user interface, and fast data retrieval are crucial prerequisites.

III. PROPOSED METHODOLOGY

A. System Architecture

The Smart Text-to-Speech Converter's modular system architecture effectively translates text into speech. The system starts with the User Interface, where users can upload documents like PDF, DOC, or TXT files or enter text directly. After that, the input is transferred to the Backend Server, which uses Flask and Python to process requests. When the input comes from files, the backend extracts text using OCR or document parsing methods. Following extraction, the Text Processing module formats the text for speech synthesis and removes superfluous characters. The Text-to-Speech Engine receives the processed text and uses speech synthesis libraries to turn it into audio that sounds natural. Ultimately, the produced audio is transmitted to the Output and Playback module, where the system plays the relevant audio output for the user and shows the text. This architecture offers effective text-to-speech conversion and guarantees seamless module interaction.

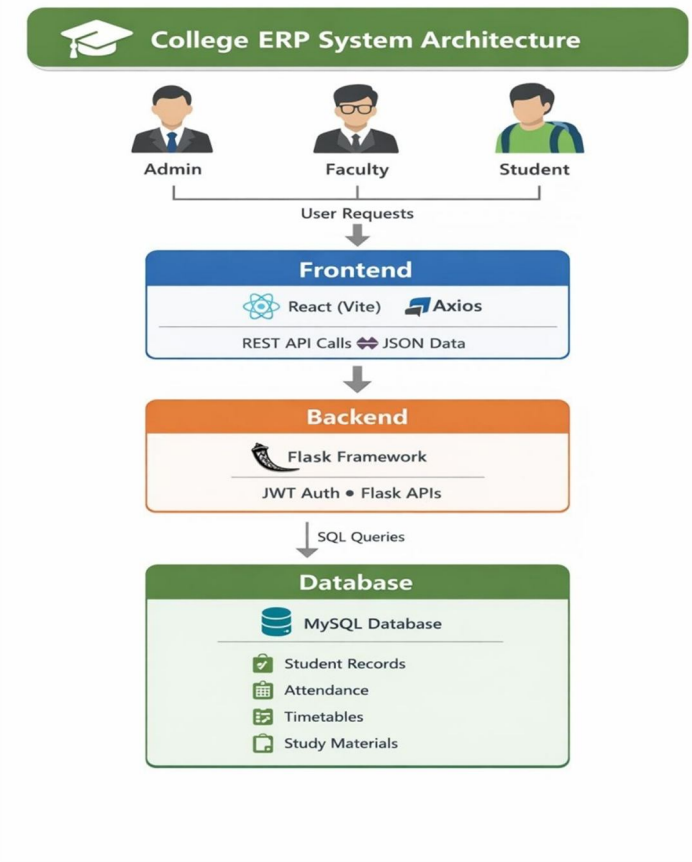


Fig. 1: System Architecture of College ERP System

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B. Overall System Workflow

The system's overall workflow starts when users, such as administrators, faculty, or students, log in with their login credentials. The system verifies the login information and grants access according to the user's role. The administrator manages system data by adding faculty and students, making schedules, and keeping track of attendance records; the faculty can view the schedule, mark attendance, and upload study materials or PDFs for students; and the students can log in to view their attendance details and access the notes uploaded by faculty.

The workflow can be summarised as follows:

1) User Login
2) Authentication Process
3) Admin Operations
4) Faculty Operations
5) Student Access
6) Database Management
7) Information Retrieval
8) System Output

This structured workflow ensures proper system functionality, role-based access control, and efficient academic management.

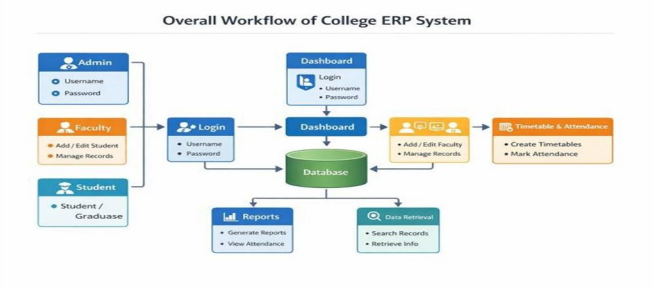


Fig. 2: Overall Workflow of College ERP System

C. User Authentication and Role Management

To manage system access, the system has a safe user authentication system. A distinct username and password are given to each user and kept in the database. The system verifies the login credentials and allocates access rights according to the user role.

The system supports three main user roles:

- Administrator
- Faculty
- Student

By ensuring that each user may only access the features pertinent to their duties, role-based authentication enhances system security and stops unwanted access.

D. Student and Faculty Management

Modules for handling faculty and student data are included in the system. A centralized interface allows the administrator to add, edit, view, and remove student and faculty member records.

The student management module stores information such as:

- Student Name
- Roll Number
- Branch
- Academic Year

Similarly, the faculty management module stores details including:

- Faculty Name
- Email ID
- Department/Branch

This module simplifies administrative work and ensures accurate record keeping within the institution.

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E. Timetable Management System

Administrators can design and oversee academic timetables for various branches and academic years using the timetable management module. The method enables faculty members and subjects to be allocated to particular days and times. The timetable includes:

- Day of the week
- Time Slot
- Subject Name
- Assigned Faculty Member

This feature guarantees well-organized scheduling and facilitates easy access to class schedules for both teachers and students.

F. Attendance Management Module

Faculty members can digitally record and manage student attendance using the attendance management module. When marking attendance for students who are present in class, faculty members can choose the branch, year, and day.

The system keeps track of attendance data, such as:

- ID of the student
- ID of the faculty
- The date

Status of Attendance: Present/Absent Students can keep track of their academic involvement by seeing their attendance records via their login.

G. Study Material Upload and Access

Faculty members can submit educational resources, such as PDF notes, documents, or learning materials for students, into the system's study material management module.

The uploaded files are linked to the database and kept on the server. Depending on their branch and academic year, students can view and download these resources.

This module is compatible with:

- Faculty members uploading study materials
- Keeping file information in the database
- Giving pupils access to downloaded materials

By facilitating easy access to educational content, this feature enhances the learning process.

H. Database Integration and Data Management

To efficiently manage all system data, the system incorporates a MySQL database. Information on users, students, teachers, schedules, attendance records, and study materials are all stored in the database.

Using secure queries, the backend establishes a connection with the database to carry out tasks like:

- Inserting data• Retrieving data
- Updating data
- Erasure of data

Effective data storage, quicker retrieval, and increased system dependability are all guaranteed by database integration.

I. System Advantages

- The suggested approach has a number of benefits:
- Centralized administration and academic data management
- Users' secure access based on their roles
- An electronic method for monitoring attendance
- Effective scheduling of schedules
- Sharing study materials is simple.
- Less paperwork and human mistake
- System architecture that is modular and scalable The College ERP System offers a cutting-edge approach to effectively managing educational establishments, enhancing professor, staff, and student productivity and communication.

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IV. EVALUATION AND RESULTS

Several modules, including administrator login, faculty administration, student information management, schedule scheduling, and attendance tracking, were tested in order to assess the College ERP System. Faculty can monitor schedules and track student attendance while administrators can effectively handle academic data.To guarantee seamless communication between the front-end interface and the backend database, testing was done. The findings show that the system successfully completes the planned tasks with dependable performance and few execution faults.

A. User Interface and Usability Analysis

For administrators and academics, the system interface was made to be straightforward, easy to use, and intuitive. Authorized users can safely access the system by entering their credentials through the login screen on the homepage. The dashboard shows several modules, including student management, faculty records, timetable development, and attendance management, after you log in.

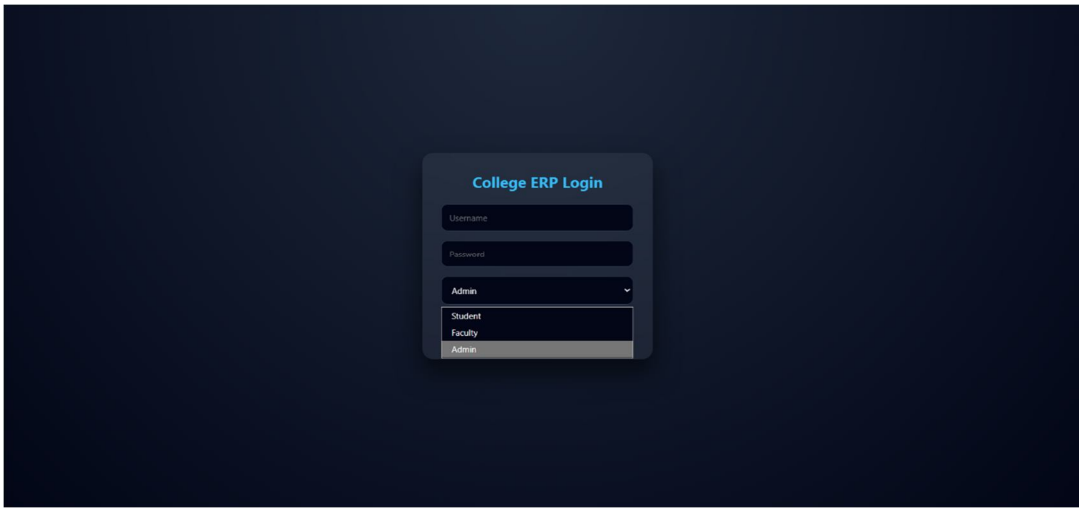


Fig .3: Admin, Faculty and Student Login Page

B. Functional Evaluation

Different operations were used across all modules to evaluate the system's functionality.

1) User credentials are correctly validated by the admin login authentication system, which also stops unwanted access.
2) Administrators can accurately add, edit, remove, and inspect student records using the student management module.
3) Faculty information is effectively stored by the faculty administration module, which also refreshes it as needed.
4) Administrators can assign faculty members and schedule subjects without controversy by using the timetable generating module.
5) Faculty can accurately record student attendance and mark attendance using the attendance management module.

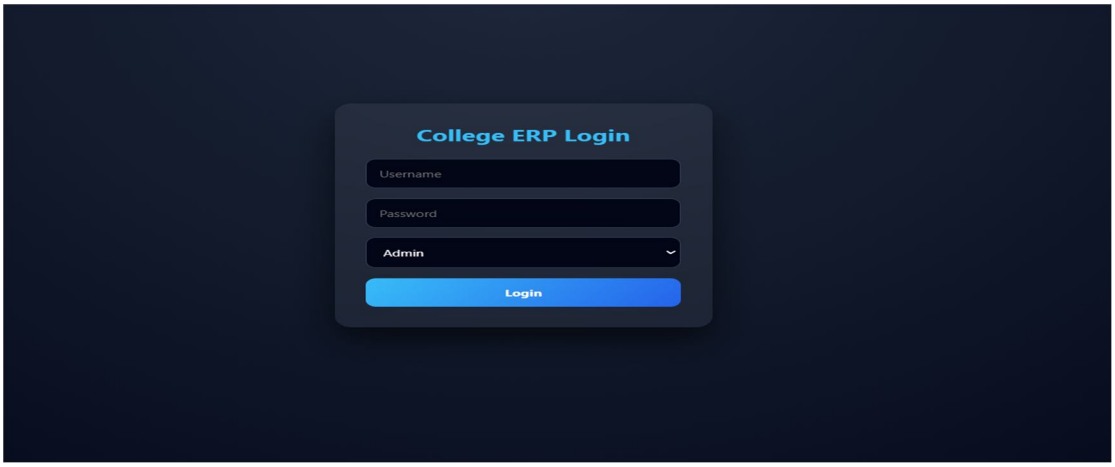


Fig. 4: Admin Login Page

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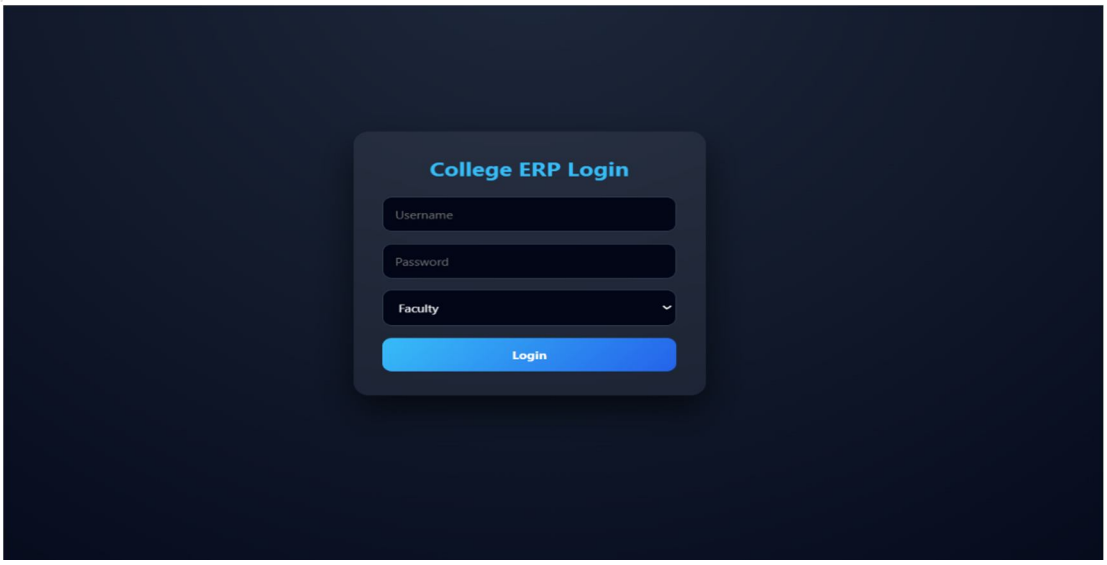


Fig. 5: Faculty Login Page

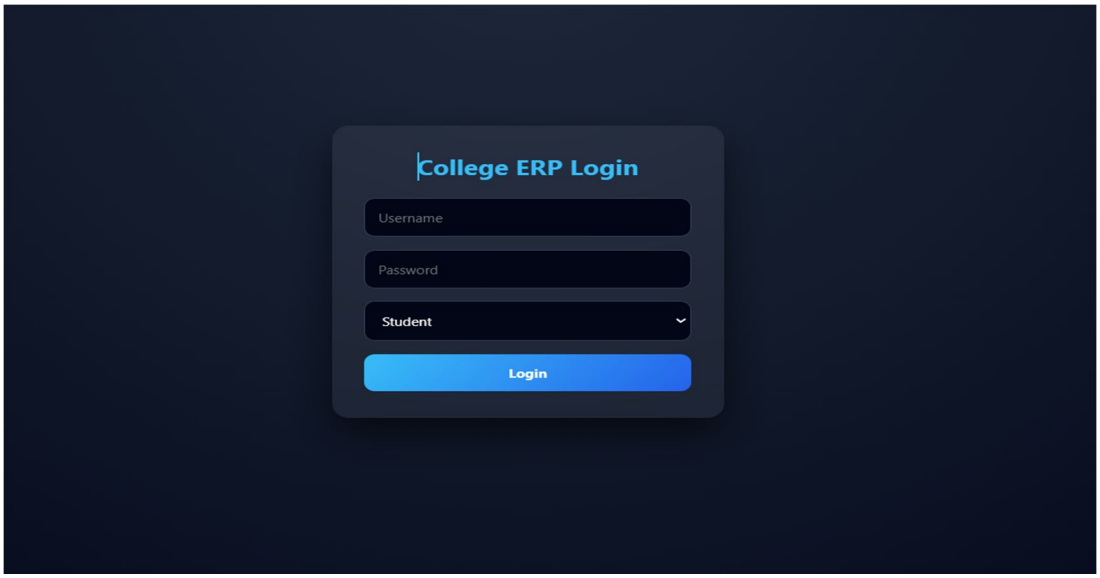


Fig. 6: Student Login Page

C. Performance Analysis

Processing speed, data correctness, and dependability were used to assess the system's performance:

1) Processing Time:

- The system manages numerous records kept in the database with efficiency.
- Because of efficient queries, data retrieval from the database is quick.

2) Audio Quality:

- The system manages numerous records kept in the database with efficiency.
- o Because of efficient queries, data retrieval from the database is quick.

3) System Reliability:

- No significant crashes or runtime issues were found throughout testing.
- Multiple requests were successfully handled by the backend server without experiencing any performance reduction.

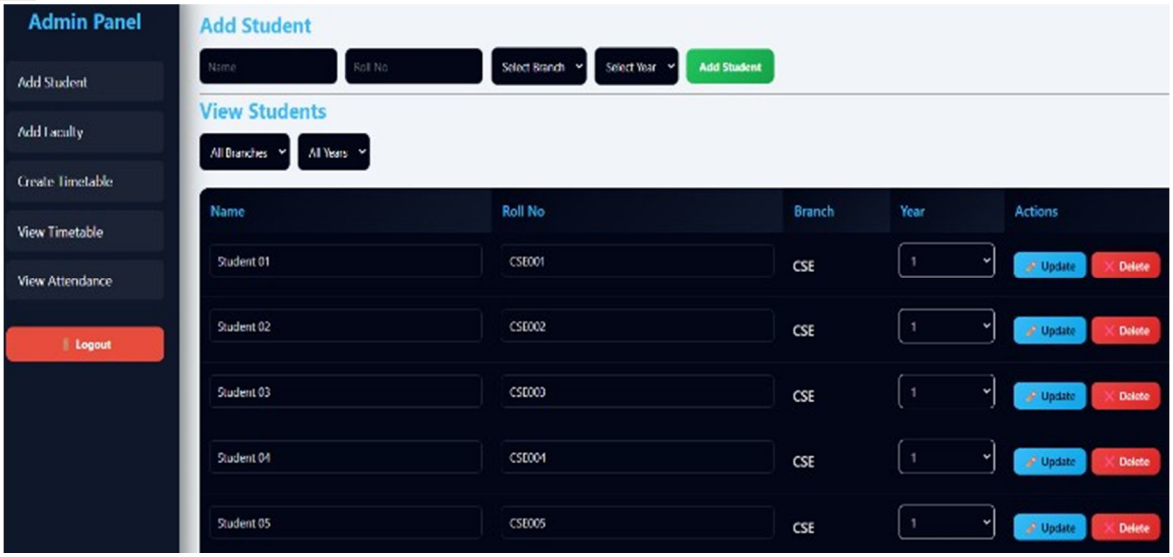


Fig. 7: Admin Dashboard

D. Data Management and Record Retrieval Module

Administrators and instructors may easily retrieve saved data thanks to the College ERP System's effective data management and retrieval feature. Using identifiers like names or ID numbers, users can look up student or faculty information. These queries are processed by the backend system, which then pulls the pertinent data from the database. This feature makes academic administration responsibilities easier and aids in keeping records organized. The evaluation's findings demonstrate that the search and retrieval processes yield precise results in a short amount of time. By facilitating administrative decision-making and providing rapid access to academic data, the incorporation of this module enhances system usability.

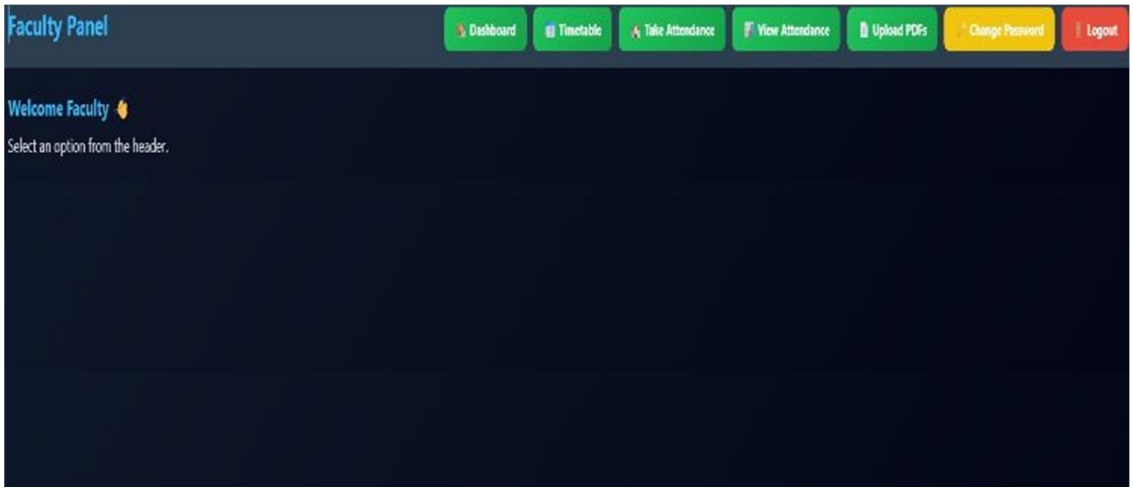


Fig. 8: Faculty Dashboard.

E. Comparative Discussion

The suggested College ERP System has certain benefits over conventional manual record management systems:

1) Faculty and student records stored digitally
2) Automated scheduling
3) Effective management of attendance
4) A mechanism for secure login authentication
5) Rapid data retrieval and report creation Large-scale ERP systems may need complicated infrastructure and expensive setup expenses, even though they may offer more sophisticated capabilities. The suggested system is appropriate for educational institutions and small to medium-sized colleges since it offers an economical and effective way to manage academic operations.

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Fig. 9: Student Dashboard

V. DISCUSSION AND LIMITATION

A. Design Validation and Key Observations

Through thorough analysis, simulation, and comparisonwith traditional bumper materials like steel and aluminum, the design of the Carbon Fibre Bumper for Cars was verified.Because of its excellent impact absorption capacity, high strength-to-weight ratio, and resistance to corrosion, carbon fiber was chosen. In order to assess the bumper model's structural performance and safety features, modeling tools were used to test it under various loading and impact scenarios. According to the investigation, the carbon fiber bumper can sustain impact forces without compromising its structural integrity. The carbon fiber bumper showed notable weight reduction as compared to conventional metal bumpers, which may enhance vehicle performance and fuel efficiency. The bumper effectively transfers impact energy, minimizing damage to other vehicle components, according to stress and deformation results.

B. Limitations and Constraints

The design and implementation of the Carbon Fibre Bumper for Cars must take into account a number of restrictions and limits. The high cost of carbon fiber material and production methods in comparison to more conventional materials like steel or aluminum is one of the main drawbacks. Specialized tools and methods are needed to produce carbon fiber components, which raises the total cost of manufacture and might prevent widespread use in inexpensive cars. The intricate manufacturing procedure required to shape and cure carbon fiber composites is another limitation. To obtain the required strength and structural qualities, processes like layup, shaping, and curing call for exact control and competent labor.

C. Alignment with Literature Findings

This project's design and development of the Carbon Fibre Bumper for Cars closely adheres to the conclusions found in previous studies and publications about lightweight automotive materials and vehicle safety. Numerous studies demonstrate that carbon fiber composites are appropriate for vehicle structural elements like bumpers because of its high strength-to-weight ratio, enhanced energy absorption, and outstanding durability. The literature also emphasizes the importance of reducing vehicle weight to improve fuel efficiency and overall vehicle performance, which supports the motivation behind using carbon fibre materials in this project. When compared to conventional materials like steel or plastic, prior studies have demonstrated that carbon fiber reinforced polymers can greatly improve crash resistance and impact energy absorption.

VI. CONCLUSION

The College ERP System is intended to streamline and automate a college's administrative and academic operations. Administrators, teachers, and students can all work effectively on the system's consolidated platform. It facilitates the orderly management of student and faculty data, attendance records, schedules, and study materials. The technology saves time and increases accuracy by decreasing manual labor and paperwork. The system is dependable, safe, and user-friendly thanks to the utilization of contemporary web technologies like MySQL, Flask, and React. Each user can only access the features that are pertinent to them thanks to role-based access.System enhances efficiency, transparency, and communication in college administration.

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VII. ACKNOWLEDGMENT

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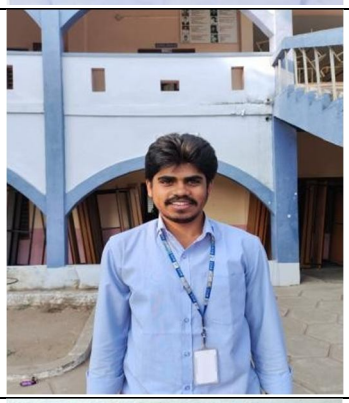
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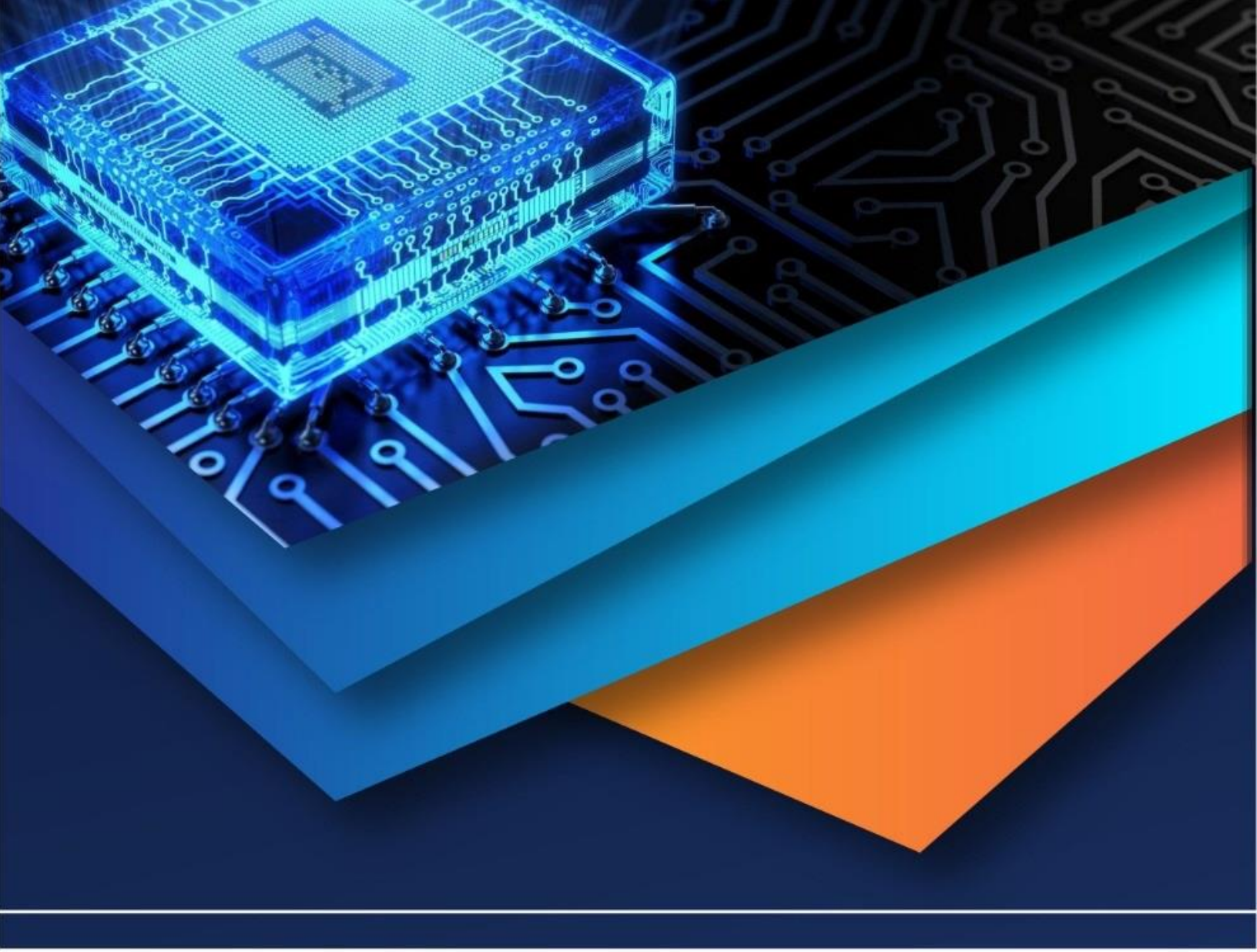


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