Implementation Of Departmental ERP System Using MERN

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Abstract-
This project focuses on creating a Departmental Enterprise Resource Planning (ERP) system using the MERN (MongoDB, Express.js, React, Node.js) stack. Admins generate login credentials for students and faculty, enabling them to seamlessly access and exchange information within the system. The React-based front end ensures a user-friendly interface, while Node.js with Express.js powers the server. MongoDB, coupled with Mongoose, serves as the backend, promoting efficient data communication. This initiative aims to enhance administrative processes, providing a modern and integrated solution for college information management.

Keywords: Full stack development, Web Development, ReactJs, NodeJs, Express, MongoDB, and Tailwind CSS.

I. INTRODUCTION

Web-based departmental ERPs are designed to manage and store project information that is used in web-based applications. The project is titled "Departmental ERP". This package, once developed, will help the school or institute manage various details about its students. This will help the accounts department in maintaining the details related to the fees and basic details like their mark sheets, attendance, etc.; it will also help the management, or, we can say, administration, department in maintaining students' basic details as well as keeping a check on fee details. This package is developed for the authorities of the school or institute to make their tasks easier, or we can say this package automates their tasks like maintaining students' details, marinating cash details, and printing receipts. This package helps the administrative and accounts department maintain student personal and fee-related details.

II. PROBLEM STATEMENT

In our college, we currently rely on a traditional manual system for managing student information, which is becoming increasingly challenging as education plays a very important role in our society. With the rising number of admissions and the establishment of new educational institutes, the volume of student records is growing rapidly.

The current manual process, though functional, is proving to be inefficient and error-prone as the number of records continues to increase. As we work to reduce illiteracy and promote education, we must evolve our systems to keep up with the demand. Manually maintaining student records not only demands a significant amount of manpower but also introduces the risk of errors. Additionally, the time required for processing and managing these records is too much.

To address these challenges, there is a need for a more efficient and automated system that can handle the growing number of student records with ease. This not only ensures accuracy but also frees up valuable human resources for more strategic and impactful tasks within the educational institution. By embracing modern technology and transitioning to a digital system, we can significantly improve the management of student information, ultimately enhancing the overall efficiency of our educational processes.

III. LITERATURE REVIEW

Until recently, the College Management System (CMS). Today, education plays a very significant role in society. Day by day, the percentage of illiterates is decreasing and the percentage of literates is increasing. Education will change society in all aspects, and everyone wants to study for a higher professional degree [2]. Admissions are increasing day by day, so the ratio of the establishment of new colleges and schools is also increasing. But the actual challenge is starting now. Most of the schools and colleges maintain student information in records [2].

When the number of records increased, it was difficult to maintain the information of each student in the old manual system. Maintaining the records manually leads to errors, requires more manpower, and consumes more time for processing the records [2].

Literature review: Various sources were reviewed, including research papers, publications, books, and recommendations by the project panel, providing ample data for the survey, [3].

Definition of automation: Automation involves reducing or minimizing manual work through the use of computers, software, and devices, enabling tasks beyond human capacities to be performed, [3].

Historical milestone: The Library Automation System at the University of Toronto (1963–1972) was one of the earliest achievements in managing data with automated systems, aiming to enhance efficiency, reduce delays, and increase production flexibility, [3].

Case study: Automation in Educational Assessment in Nigeria demonstrates how online systems can eliminate human errors and ensure fairness during exams, [3].

Challenges in transitioning to a paperless workplace: Organizations face difficulties in bridging the gap between paper-based and online automated systems, [3].

Role-Based Access Control: Institutional organizations use this method to grant privileges based on user roles, ensuring system efficiency and preventing misuse of sensitive information, [3].

Proposed Student Management System: Aim to overcome the limitations of offline paper-based systems by offering an automated online approach for everyday record-keeping in academic institutions, [3].

Features of the proposed system: Provides easy access to student statistics, facilitating evaluation of student development on a single platform, [3].

Student Management Application: Processes student documents and records using automatic computation techniques, assisting both students and faculty members while saving time and resources, [3].

Advantages of online systems: simultaneous data access from anywhere, anytime, ensuring efficiency and usefulness for all users by making data accessible globally, [3].

IV. SYSTEM ARCHITECTURE

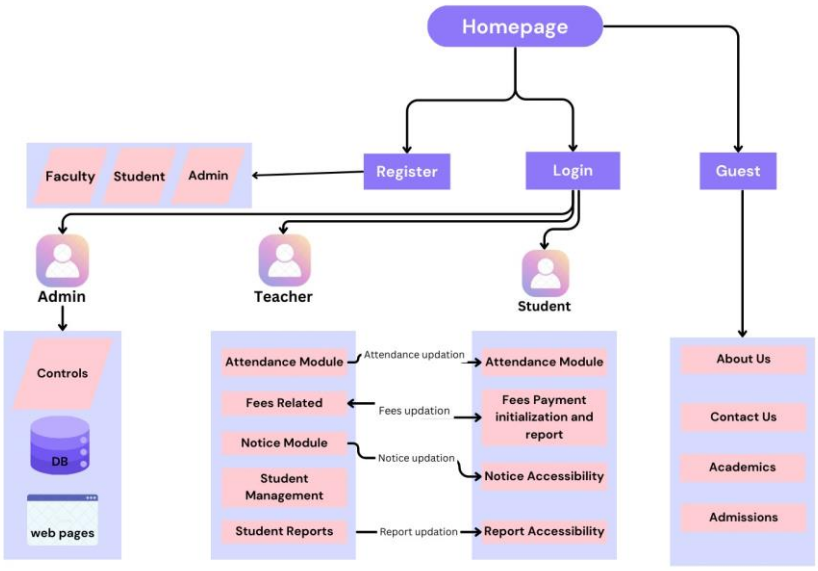

Fig. 1 (System Architecture)

Here are the various modules of the overall project:

1. Home page: The Home Page Module serves as the main entry point to our online campus. It warmly welcomes users with an attractive interface, providing a sneak peek into the numerous features and resources available on our platform. It's the starting point for exploring what our platform has to offer.
2. Login page: The login page first confirms if the visitor to the website is a student, teacher, or the admin himself. After confirmation, access to several pages of the website is provided after the credentials are verified.
3. Registration page: The registration portal allows new students and teachers to sign up, ensuring secure data storage by hashing passwords in the MongoDB database. A unique ID is assigned to new students upon admission to maintain system accuracy. This ID serves as a prerequisite for creating a new account, preventing unauthorized access, and ensuring the integrity of the system. This measure prevents individuals from creating multiple accounts and gaining access to restricted areas without the appropriate credentials.
4. Fees management module: The Fees Management Module, available to students and the college's account section, empowers students to effortlessly view, manage, and conveniently make online payments for their fees through the user-friendly interface of the website. This streamlined process enhances financial transparency and provides a seamless experience for both students and the college administration.
5. Attendance module: the attendance module enables the teachers to enter the student's attendance according to their course and generate an attendance report every month.
7. Notice module: The Notice module acts as our virtual bulletin board, providing a dynamic hub for essential updates and announcements. It keeps everyone in our academic community informed and engaged with timely and important information.
7. Placement module: The Placement Module is designed for efficiently handling the institute's placement records, ensuring a seamless process for managing and organizing placement-related information, and facilitating effective placement procedures.

V. HARDWARE AND SOFTWARE REQUIREMENTS

We need the following software to accomplish our project:

1. The VSCode IDE – It is a robust code editor that provides a seamless environment for writing and managing code.
2. MongoDB is a versatile and cross-platform document database.
3. ExpressJS – It is a powerful back-end web application framework.
4. ReactJs - It is a user-friendly JavaScript library designed for crafting dynamic and engaging user interfaces.
5. NodeJs is a cross-platform JavaScript runtime environment that facilitates server-side development.
6. Browser: Compatible with any modern browser, including Chrome, Firefox, Edge, etc.

We will need the following hardware to accomplish our project:

Desktop or laptop:

a) A reliable computing device capable of running Windows 10 32-bit.
b) Equipped with a minimum of 4GB of RAM to ensure optimal performance.
c) Storage capacity of at least 256GB on the hard disk, providing ample space for project files and data.

This well-configured hardware setup ensures a smooth and efficient development environment for our project.

VI. SYSTEM ANALYSIS AND DESIGN

Requirement Specification –

1. Functional Requirements –

1. User authentication:

- The system ensures secure access through user authentication.
- Users, including administrators, students, and faculty members, must provide valid login credentials comprising a username and password.

2. Admin Module:
- Administrators hold the authority to efficiently manage student and faculty information.
- Admins can perform operations such as adding, viewing, editing, and deleting student and faculty records.
- Access to the admin module is restricted and requires authentication.

3. Student Module:
- Students enjoy the convenience of viewing their details within the system.
- Access to student details is personalized and limited to the respective student's information.
- Authentication is mandatory for students to access their modules.

4. Faculty Module:
- Faculty members can effortlessly access and review their details.
- Similar to students, access to faculty details is restricted to the respective faculty member's information.
- Authentication is a prerequisite for faculty members to access their dedicated modules.

2. Non - Functional Requirements –

1. Performance: The system is designed for efficient handling of concurrent users, ensuring seamless operation even when multiple users access it simultaneously through various web browsers.

2. Reliability: Database operations, especially updates, adhere to transaction processing standards. This ensures data consistency and prevents errors or inconsistencies, enhancing the overall reliability of the system.

3. Availability: The project will reside on a publicly accessible shared server, guaranteeing continuous availability. Users worldwide can access it via the internet 24/7, contributing to a reliable and accessible user experience.

4. Security: Robust security measures are implemented to safeguard user data from external threats. The system prioritizes the protection of sensitive data, ensuring a secure environment for users.

5. Browser Compatibility: The web-based project is meticulously crafted to be compatible with popular web browsers, including Microsoft Internet Explorer, Mozilla Firefox, Opera, and Google Chrome. This compatibility ensures a consistent and reliable user experience across various browser platforms.

DFD Diagrams –

1. Zero Level DFD

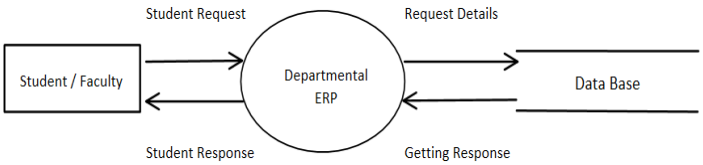

Fig. 2 (Level 1 DFD)

2. First Level DFD –

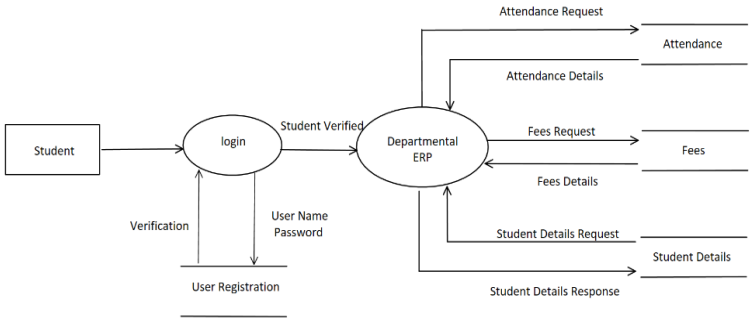

Fig. 3 (Level 2 DFD)

3. Second Level DFD

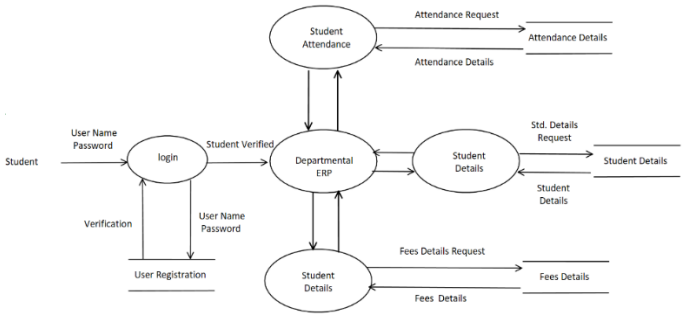

Fig. 4 (Level 3 DFD)

Use Case Diagram –

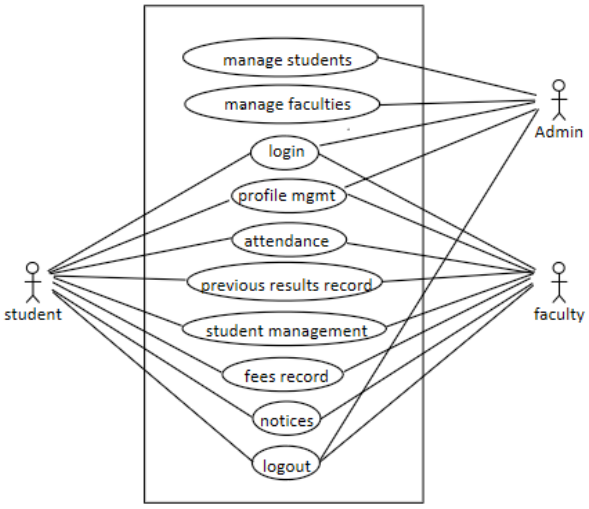

Fig. 5 (Use Case Diagram).

VII. TECHNOLOGIES

HTML: HTML short for Hyper Text Markup Language, serves as the fundamental markup language for crafting documents meant to be showcased in a web browser. It seamlessly collaborates with supplementary technologies like Cascading Style Sheets (CSS) and dynamic scripting languages such as JavaScript.

CSS: CSS (short for Cascading Style Sheets) is a language for styling web documents, like HTML. It excels at separating presentation—layout, colors, and fonts—from content, enhancing accessibility and flexibility. By specifying CSS in a separate file, it enables consistent formatting across multiple pages, reducing complexity and optimizing page load speed through caching.

JavaScript: JavaScript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side scripts to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities.

MERN stack: The MERN architecture allows you to easily construct a 3-tier architecture entirely using JavaScript.

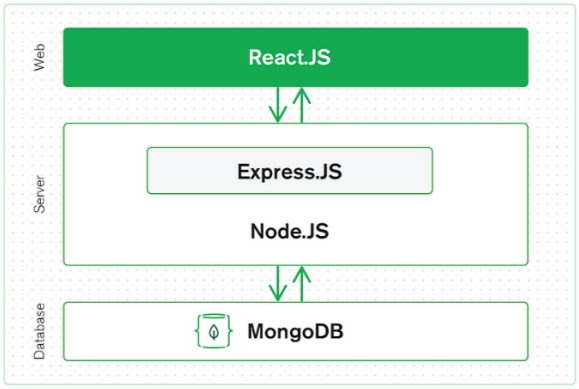

Fig 6. MERN Stack

MongoDB: MongoDB is a NoSQL database system that stores data in a flexible, JSON-like format, known as BSON. It offers high scalability, allowing data to be distributed across multiple servers, and is designed for handling large volumes of unstructured or semi-structured data. MongoDB uses collections to group related documents and provides a rich query language for data retrieval. It is particularly suited for applications requiring fast and flexible data access, such as web and mobile apps. MongoDB's horizontal scaling and automatic sharing make it a popular choice for handling big data and real-time analytics.
Express JS: (Express.js is a minimal and flexible Node.js web application framework that simplifies building robust web applications and APIs. It provides essential features like routing, middleware support, and template engines. Express allows developers to create server-side applications efficiently, handle HTTP requests and responses, and manage routes for different URL paths. It is widely adopted in the Node.js community for its simplicity and extensibility, making it an excellent choice for building web services and applications quickly and effectively.
React JS: Ract.js is a JavaScript library designed for building dynamic and interactive user interfaces (UIs) in web applications. Developed by Facebook, it follows a component-based architecture. With React, developers can create reusable UI components that manage their states, and the library efficiently updates the UI when data changes. This "virtual DOM" approach optimizes performance, making React a popular choice for crafting modern, responsive, and efficient front-end experiences.
Node.js is a cross-platform JavaScript runtime environment that executes JavaScript code on the server side, allowing developers to build scalable and high-performance server-side applications using the same language as the front end.

VIII. PROJECT MODULES AND DESIGN

Fig 7. Homepage

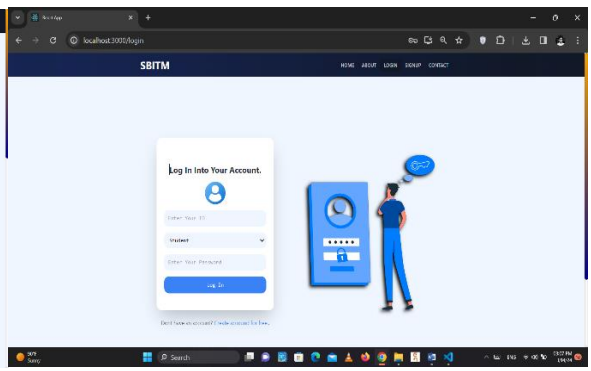

Fig 8. Login Page

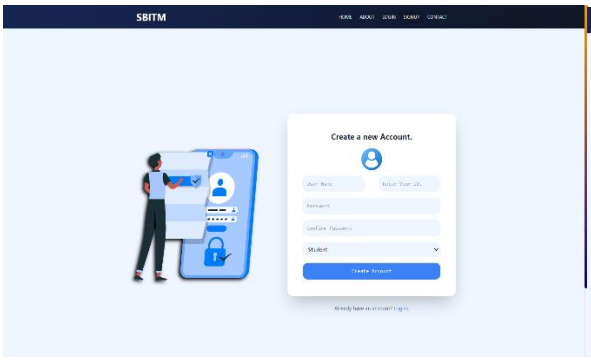

Fig 9. Sign UP Form

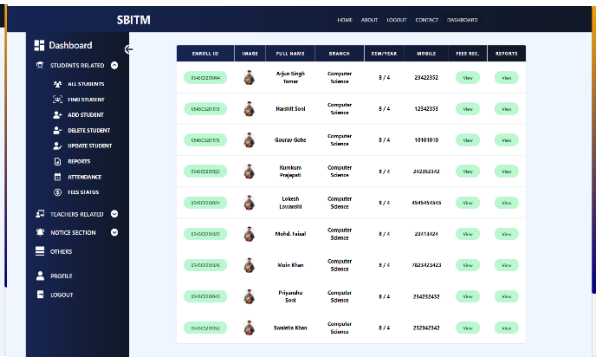

Fig10. Teacher dashboard

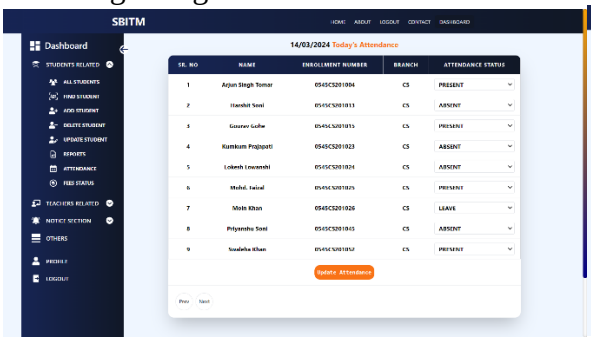

Fig 11 Attendance Section.

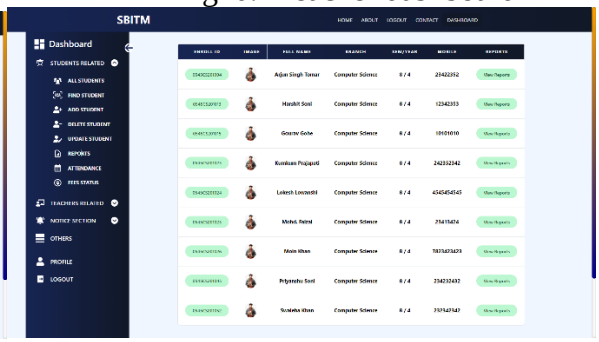

Fig12. Report Section

IX. CONCLUSION

College ERP management using MERN Stack provides an easy way to automate the functionalities of the college. It is an integrated platform that connects various departments of an institution, like administration, staff, students, and guardians. It provides reliability and time savings and is easy to control. Information can be saved and accessed at any time by an authorized user. It includes almost all modules required for seamless college functions. The Intelligent Departmental ERP system offers a practical solution to the Faculty of Computer Engineering's challenges in handling student data and study planning manually. This system promises improved academic management efficiency and a departure from outdated paper-based methods.

With benefits for program heads and academic advisors, this system streamlines student guidance and eliminates the laborious task of sifting through paper records. Its primary aim is to provide students with a dependable tool for managing their academic journey within the faculty effectively. Furthermore, it reduces administrative paperwork and can potentially be extended to a mobile app for parents to monitor their child's progress and attendance conveniently.

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