



Online College Portal using MERN Stack

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ABSTRACT

This paper is aimed at developing an online application system that is of importance to the college. The system is generally called Online College Portal and is built and developed using the MERN Stack. This system can be used to observe students' activities; students can also interact with college management. This application is being developed for an engineering college to maintain and facilitate the exchange of information. For this, the users must register with the portal. It is an Internet-based multi-user application that aims at providing information to all levels of management within an institution. For a given college, the student and staff (technical and non-technical) can access the system to access the required information related to the college management retrieved from the database.

KEYWORDS: MERN, MongoDB, ExpressJS, ReactJS, NodeJS, Full Stack Development, Web Application Development, Single Page Application, Rest API

I. INTRODUCTION

The Internet impacts student life in numerous ways and in times of pandemic this impact is increased exponentially. Today's schooling state of affairs is hastily converting and demanding. The students expect more stages of verbal exchange among college, scholar and school participants to have the highest quality use of resources.[1] This application is an Internet-based multiuser application called Online College Portal using MERN Stack. It provides a regular flow of information for decision-making.

In our day-to-day life, web applications are used in most places

These can be accessed from anywhere and are easy to operate. This system is based on real-life situations taking into consideration all possible conditions and

functionalities of the daily work in college It is developed to maintain and facilitate easy access to information. The core idea of this project is to implement a web-based online college portal for the advancement of institutions and educational systems. This portal will be used by students and faculty, to operate this system the users must be registered after which they can access as well as modify data as per the permissions given to them. This system helps the admin to keep track of students. The admin gets admission to the database of the system. In an educational institute, management is a crucial thing. So to reduce the efforts of staff we are introducing our system. The system comes with many functionalities like attendance, notes, class tests and attendance records. This system is paperless. The

gadget affords capability for the scholar to utilise in which admin can manage, the scholar can get admission to uploaded notes, direction details. Overall workforce and reduces the time required.

It has three modules: admin, faculty and student. Admin adds system details like students, faculties, subjects, departments, section details and has all control over the system. Teachers can upload notes, assign assignments, tests and attendance. Students can view their attendance, upload test sheets and view notes.

MERN is a JavaScript-based full stack that helps you design, debug and maintain a web-based application. MERN stands for and consists of MongoDB, ExpressJS, ReactJS, NodeJS. [2]

MongoDB is a NoSQL database and is a crossway document-oriented database with no SQL attributes. Express is a framework layered on top of NodeJS, used to build the backend of a site using NodeJS functions and structures. NodeJS is a JavaScript runtime environment. It is used to run JavaScript on a machine rather than a browser. React is a library created by Facebook used to build UI components that create the user interface of the single page web application.

II. LITERATURE SURVEY

Every year, the share of illiterates is reducing and the share of literates is growing. Education is converting society into all components. All people desire to examine for better expert degrees. Admissions are growing every day. The ratio of the established order of recent faculties and colleges also are growing. But the real assignment is beginning now. Most of the colleges and faculties hold scholarly data in facts. When the wide variety of facts increased, it became hard to hold the data of every scholar inside the antique guide system. Maintaining the facts manually results in error-inclined mess and calls for greater manpower and greater time for processing the facts. This is especially true in the hard times of this pandemic when almost everything is going online.

This change in the mode of education and conducting educational activities has seen a dire need and requirement for online tools and services that automate such activities and help in keeping stuff in one place, preferably online. [3]

III. OBJECTIVE

The major goal of this project is to create a functional system. It should be dependable, quick, consistent, and adaptable enough to accommodate any future improvements. The process of handling student and faculty information in an institute becomes more mobile and automated using this technology. By offering centralised control over the entire system, the portal bridges the gap between end-users, namely students and faculty. It is used by several departments to sequence different procedures that are isolated from one another. As a result, the portal must be able to keep track of all data, activities, and all information of the admin's services. It should also provide all the common services that are done on a daily basis by the students and faculties of a college, along with handling data by the admin.

IV. PROBLEM STATEMENT

During the COVID-19 pandemic, students' education lagged; to close this gap, different internet tools assisted practically in all colleges, institutions, and other organisations. An online poll was undertaken to determine the efficiency of online teaching and learning methods for university and college students. The following strategies were discovered to encourage efficient online learning: animations, digital collaborations with peers, video lectures offered by subject-matter experts, online quizzes with MCQs, faculty interactions during lectures, and online materials provided by the faculty, among others [3]. As a result, the faculty utilises several platforms such as Google Meet, Zoom, Microsoft Teams, and Google Classroom to provide notes, assignments, and assessments. It is extremely difficult to access all of these platforms, and it takes a long time to maintain and manage all of the student records. As a result, this portal is being developed to give a consolidated solution to this problem by combining numerous functionalities for students, faculty, and administrators on a single platform.

V. PROPOSED WORK

The portal makes it simple for teachers and students to communicate with one another in a structured manner. This web application automates all of the tasks associated with storing and disseminating knowledge, which is critical in

colleges. Admins, instructors, and students are all given us the ability to build a REST API server. It can set up proper logins with time and role-based protected access. It middleware to reply to HTTP requests by managing a must work in a multi-user environment and have concrete server and routes for a web application. It includes all of security features such as the ability for administrators to the essential features for mobile phones and web apps create students and faculty accounts and grant privileges to browsers. Express JS is simple to set up and connect to databases like MongoDB and MySQL, among others.[9]

Separate sections are available for various duties in this portal. It allows professors to upload all pertinent material, such as notes, assignments, tests, attendance, and other papers. Students can use their gadgets to view and download all essential materials. Faculty provide online meeting connections to students in specific semesters/years/classes.

VI. TECHNOLOGY USED

MongoDB:

MongoDB is a database that stores all of the information needed by students and instructors. MongoDB supports a variety of document schemas. The information is kept in binary JSON format. It has a lot of query processing capacity. It stores data in RAM, allowing for speedier data access. It has a lot of flexibility when it comes to storing, managing, and accessing unstructured data.[6] It can store a vast amount of different data in the simplest way possible. The fundamental benefit of MongoDB is that data fields can differ from document to document, and the data structure can be altered over time. MongoDB also has a powerful query language that aids in the creation, read, update, and deletion (CRUD) of data, as well as data aggregation and text search. The MongoDB replica set ensures data redundancy and automatic failover. [7]

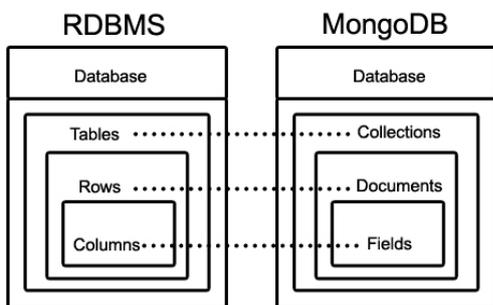


Fig: 1 Comparison of SQL and NoSQL Database structure

Express JS :

Express JS is a node JS-based web framework. It's simple to use and practically foolproof to customise.[8] It gives

React JS :

The declarative JavaScript library for constructing dynamic client-side apps in HTML is known as ReactJS.[11] It is an open-source front-end JavaScript toolkit for constructing user interfaces or UI components that abstracts the document object model, allowing for easy acting and powerful application development knowledge. It ensures faster rendering and is Search Engine Optimization (SEO) friendly. It provides reusable components, lowering the overall cost of web application development. ReactJS is capable of acting as a standalone MVC model.[10] Because of the decoupling, it is incredibly responsive and facilitates debugging. React is best known for allowing the creation of large, complex web-based apps that can update their data without requiring page refreshes.

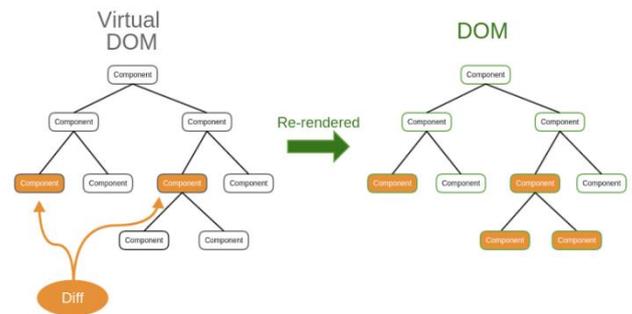


Fig: 2 Virtual DOM rendering in ReactJS

Node JS :

For JavaScript, Node JS provides a cross-platform runtime environment. It's commonly utilised to create large-scale applications. It is very customizable and adaptable. It makes use of back-end API services, but it was also built with real-time push-based architectures in mind, which is an added benefit. It benefits from non-blocking run input-output operations, which improve performance. It's an open-source runtime environment for networking and server-side application development. [12]



Fig: 3 Non-blocking architecture of NodeJS

VII. REQUIREMENT ANALYSIS

Hardware requirement :

We will need the following hardware to accomplish our project:

1. Server-side: 1GB RAM or above, 24 GB Hard Disk computer with internet connectivity.
2. Client-side: Any PC, which can support any Windows or iOS environment with any browser to run the application.

Software requirement :

We will need the following software to accomplish our project:

1. Server-side: MongoDB is used as a database. Node JS and Express JS are used for javascript runtime and backend server respectively. [6].
2. Client-side: ReactJS is the software that is used to build frontend UI that works on any browser.[6].

VIII. MODULES

Student Interface:

In students' modules, they can view their percentage of attendance, test marks, download the notes, and can view their timetable on daily basis. There is a space for assignment submission, test submission, online class links provided by each faculty according to the timetable.

Faculty Interface:

In the faculty's module, they can upload the notes, assignments, tests, marks, and enter attendance through which students can see their percentage of attendance directly. Also, faculty will provide the online class links for the students on daily basis according to the timetable.

Admin Interface:

This module provides all the authority to the admin,

which includes adding faculties, assigning students to faculties, assigning faculties to the subject, assigning timetable, etc.

IX. SYSTEM FLOW

The registration of the HOD, staff, and professors is the first stage in this application. They must first register in the database, after which authentication will be supplied. For registration, the individual will submit his or her email address and password. After enrolling, the administrator has access to the system and can do various tasks for students and professors. He or she may now see the admin webpage, which includes choices for creating a student account and determining which class the student belongs to. Admin will create and add student and faculty accounts to the database, as well as enter login credential information. The system can only be accessed completely by the administrator. In addition, according to their teaching limit, the teacher is assigned to a certain class for a specific subject. The timetable for a certain teacher is created and distributed to the subject faculty and students.

Students and faculty are then added to the database, along with their classes. After that, students can go to their homepage and access their notes, assignments, tests, timetable, and so on. There is a section for submitting assignments and examinations for a specific subject. They can upload their documents there and will be updated after they have been submitted. Additionally, each faculty member marks the attendance of their classes daily, and a percentage is calculated accordingly. They will be alerted of online class links provided by relevant topic professors in the scheduling area. Students can click on those links to be redirected onto various platforms for attending classes, such as Google Meet, Zoom, and others. They can also access and download the numerous documents provided by their professor.

Faculty will keep track of all students' activities, such as uploading their test scores, notes, and assignments, and will send out notifications as needed. In the discussion space available to them, faculty and students can communicate with one another. Queries are answered. Faculty will take attendance during the lecture within that period and grade students according to the schedule provided. They provide online class links for students. This portal also keeps track of other alerts

related to college activities. Students can use the timeline to keep track of recent notices or notifications related to submitting assignments, tests, and other tasks. The administration or faculty sends notices to the pupils. Students' landing pages receive useful information, college notices, and crucial announcements.

X. ADVANTAGES

1. This portal can only be accessed by authorised personnel.
2. The administration procedure will be substantially simplified and expedited thanks to the portal.
3. Using the internet, users would be able to quickly download notes/assignments or tests from anywhere.
4. It is simple to set up, safe, and secure, with simple procedures.
5. It has all of the necessary modules for smooth working of all college operations on a daily basis.
6. Access to class schedules and attendance information over the internet.

XI. RESULTS AND DISCUSSION

The development process ended with the completion of the web application ready for any college to use for their daily activities. Students can log on and get access to their college stuff like online class links, assignments, tests and also check their attendance in each subject.

Faculties have the option to provide links for their classes in various sections. They can also upload and assign assignments, assessments and notes. Faculties also have the option to mark attendance for their respective day's classes. They do not have the option to alter attendance of any previous day such that the integrity of the attendance can be maintained.

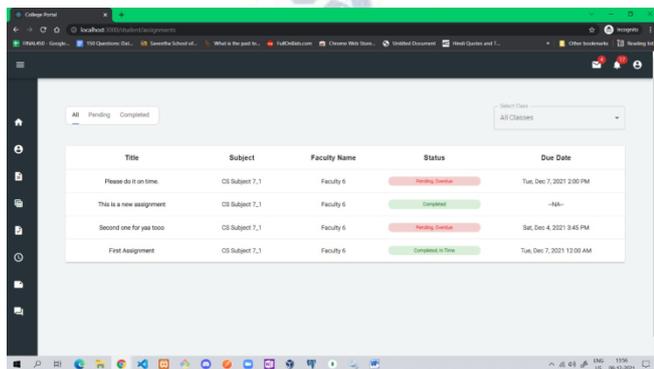


Fig: 4 Assignment Module for Faculty

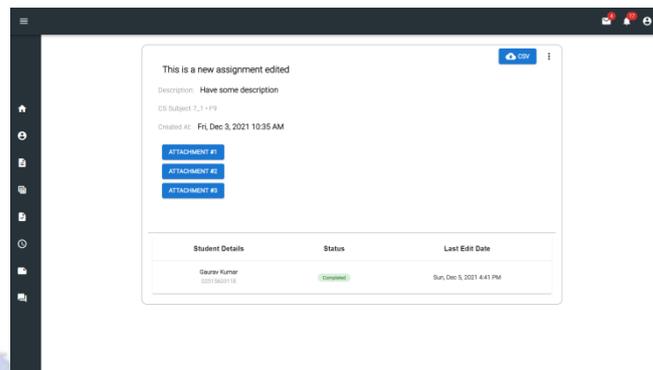


Fig: 5 Assignment Submissions sub-module for Faculty

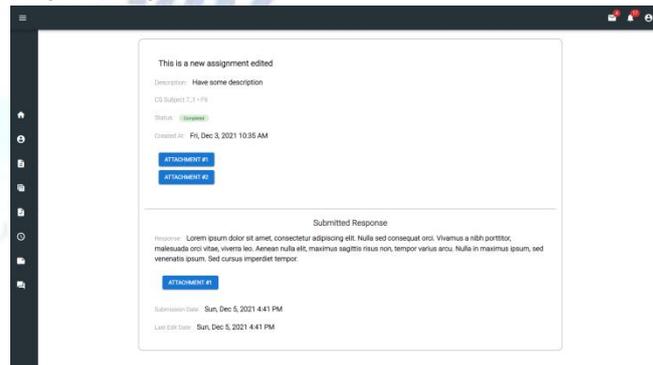


Fig: 6 Individual Submission

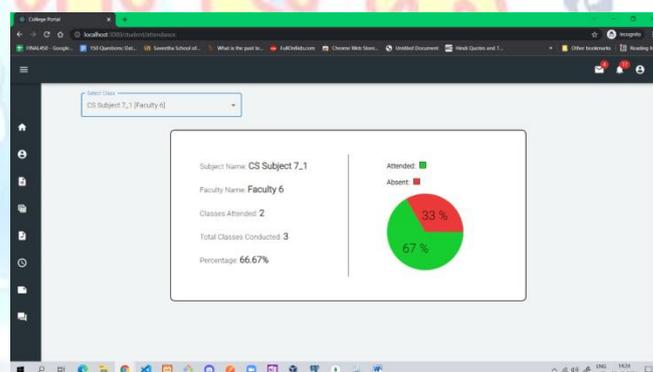


Fig: 7 Attendance Module for Student

Admins have the options to create new user accounts for students, faculties and staff members. They can also add things like new subjects, departments, classes and section details to the database, as and when necessary based on the requirements and privileges.

XI. CONCLUSION AND FUTURE SCOPE

Users benefit from the system's dependability, time savings, and ease of control. To keep the data safe and secure, a basic database is used. This gateway allows for simple operations to be carried out. The user interfaces are simple and appealing, and the operator can learn how to utilise the system in a short amount of time. All of the data gathered can be saved and viewed at any time. As a result, the data in the repository aids

management in making decisions. As a result, a web-based system is preferable. Based on a literature review and an analysis of the current system, we have determined that the suggested system will not only help the institution automate, but will also help to digitise the system, allowing for more efficient resource deployment.

Its goal is to eliminate the drawbacks of manual methods. Future developments could include incorporating the same and extensive functionality of this portal onto mobile applications to provide on the go mobile access to all the functionalities to the users. Another option that can be added in the application is to create its own video conferencing solution and use it to create an online platform for conducting classes with students.[13][14] This would eliminate the need to use 3rd party applications like Google Meet, Zoom or Microsoft Team completely, thus making the system more centralised and a one stop destination for all college needs of the students and faculties.

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