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# Redesigning the GCOEC Website along with Chatbot Integration

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**ABSTRACT-** In the digital era, educational institutions must optimize accessibility and efficiency in delivering information to students and stakeholders. This project presents a comprehensive redesign of the Government College of Engineering, Chandrapur (GCOEC) website, aimed at improving usability, navigation, and interactivity. The redesigned platform serves as a centralized hub for essential college-related information, including admissions, academic programs, fee structures, hostel facilities, and event updates.

A key enhancement is the integration of an AI-powered chatbot, developed using Botpress, to automate responses to frequently asked questions, providing real-time assistance for admission procedures, course details, fee payments, and campus facilities. The system is built on a MERN stack (MongoDB, Express.js, React.js, and Node.js) to ensure scalability and dynamic content management. MongoDB enables flexible data handling, while Express.js and Node.js provide a robust backend infrastructure. React.js, with its component-based architecture, enhances user engagement through an intuitive and responsive interface.

Strapi serves as the content management system, efficiently handling dynamic content updates. The chatbot, fully developed within Botpress without external API dependencies, leverages structured workflows and predefined responses to enhance automated query resolution. This integration reduces administrative workload, improves response efficiency, and ensures 24/7 accessibility of information.

This project transforms the GCOEC website into an interactive, user-centric digital ecosystem, significantly enhancing navigation, information accessibility, and automated student support. Future improvements may include multilingual support, expanded knowledge bases, and deeper integration with academic portals for a more seamless digital experience.

***Key Words*:** Redesign, UX enhancement, MERN stack, CMS, Accessibility AI chatbot, Botpress, Automated support.

## 1.INTRODUCTION

The Government College of Engineering, Chandrapur (GCOEC) aims to modernize its website and integrate an AI-powered chatbot to enhance usability, engagement, and efficiency. The current website suffers from navigation issues, broken links, outdated design, and poor mobile responsiveness, making it difficult for students to access essential information. Additionally, manual administrative tasks lead to inefficiencies and delays. To address these challenges, the project utilizes the MERN stack (MongoDB, Express.js, React.js, and Node.js) for a dynamic and scalable platform, with MongoDB managing academic and administrative data, Express.js and Node.js ensuring secure API interactions, and React.js providing a responsive user interface.

A content management system (CMS) enables faculty and administrators to update content seamlessly. A key feature is the AI-powered chatbot built with Botpress, offering instant responses to queries related to admissions, schedules, and administrative processes, reducing workload and providing 24/7 support. Security is reinforced with robust authentication, encrypted communication, and role-based access control, while accessibility features like keyboard navigation, screen reader compatibility, and a mobile-first design ensure inclusivity.

By integrating modern web technologies and AI-driven automation, this project enhances GCOEC's digital infrastructure, creating an efficient, user-friendly, and engaging platform for students, faculty, and stakeholders.

## 2. LITERATURE REVIEW

1. Numerous studies have emphasized the significance of user-centered design in enhancing the functionality and accessibility of academic institution websites. Research highlights that effective website design should prioritize intuitive navigation, responsiveness, and structured content organization to improve user experience and engagement [Nielsen, 2020]. However, many college websites suffer from cluttered interfaces, disorganized information architecture, and non-mobile-friendly designs, leading to decreased usability [Smith & Jones, 2019].

2. For instance, a study on university web portals in India found that most institutional websites lack a consistent design framework, making it difficult for students to find relevant academic and administrative information [Gupta & Verma, 2021]. Similarly, studies on government college websites indicate that broken links, outdated information, and poor responsiveness negatively impact accessibility and user satisfaction [Kumar et al., 2022]. Furthermore, research suggests that the absence of interactive features, such as an alumni helpdesk and automated grievance systems, limits engagement and fails to address the diverse needs of students and faculty [Sharma & Patel, 2020].

3. To address these issues, institutions worldwide have adopted structured design frameworks that incorporate improved UI/UX principles, mobile-first approaches, and AI-powered chatbots to assist users in real-time [Brown & Williams, 2023]. Notably, universities that implemented well-organized content management systems (CMS) and integrated search functionalities reported significant improvements in navigation efficiency and overall user experience [Davis & Clark, 2021].

4. The redesign of the Government College of Engineering, Chandrapur (GCOEC) website aims to address these gaps by focusing on enhanced usability, streamlined navigation, and modernized digital infrastructure. By incorporating structured department pages, an interactive alumni helpdesk, a grievance redressal system, and a responsive design, the revamped website seeks to provide a seamless and accessible digital experience for students, faculty, and alumni.

5. Chatbots have emerged as a crucial solution to enhance website functionality by providing instant responses to user queries, reducing navigation complexity, and improving accessibility. Research indicates that AI-driven chatbots significantly improve user engagement by addressing frequently asked questions (FAQs), guiding users through website sections, and automating administrative processes such as admissions inquiries and fee-related queries. Additionally, chatbots reduce the burden on administrative staff by handling repetitive queries, ensuring that students and faculty receive quick and accurate information without human intervention.

## 3. SYSTEM ARCHITECTURE

### 3.1 Website

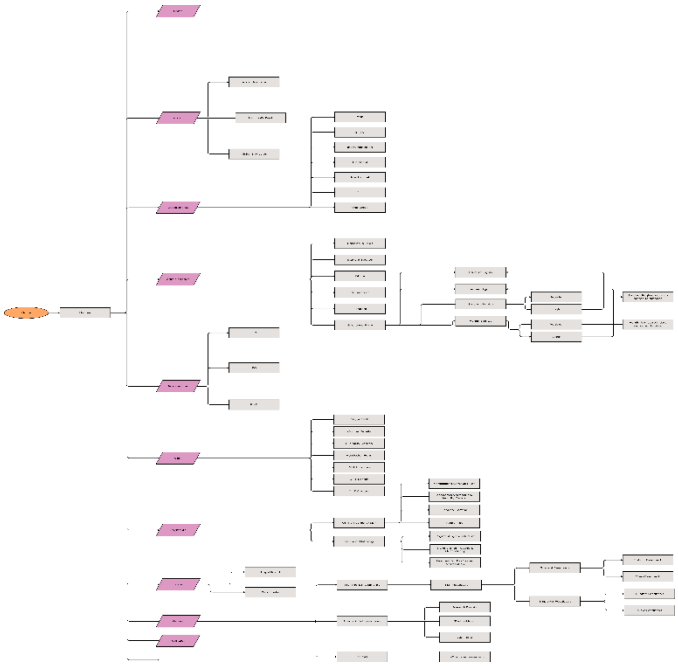

**Fig –3.1**: System Architecture of Website

The system architecture of the GCOEC college website is designed to enhance user experience, ensure secure data management, and provide seamless interaction between students, faculty, and administrators. It follows a client-server model, where the frontend interacts with the backend server, database, and third-party APIs to deliver core functionalities such as academic updates, event management, and secure authentication.

**System Components:**

- ✓ Frontend Application: Developed using React.js, the website ensures an interactive and responsive user experience. The component-based architecture enhances modularity, while React Router provides smooth navigation. The frontend is optimized using Vite, improving performance and load times.
- ✓ Backend Server: Built with Node.js and Express.js, the backend efficiently handles API requests, ensuring smooth data communication. It incorporates RESTful APIs to manage academic records, event scheduling, and content updates. JWT-based authentication secures access, preventing unauthorized entry.
- ✓ Database Management: MongoDB serves as the database, storing user credentials, event details, and academic resources. The integration of Mongoose ORM ensures structured database operations, while role-based access control (RBAC) differentiates permissions for students, faculty, and administrators.
- ✓ Security and Authentication: The website prioritizes security through JWT authentication for secure login sessions and data encryption techniques to safeguard sensitive user information. Role-based authorization prevents unauthorized modifications to critical content, maintaining data integrity.

### 3.2 Chatbot

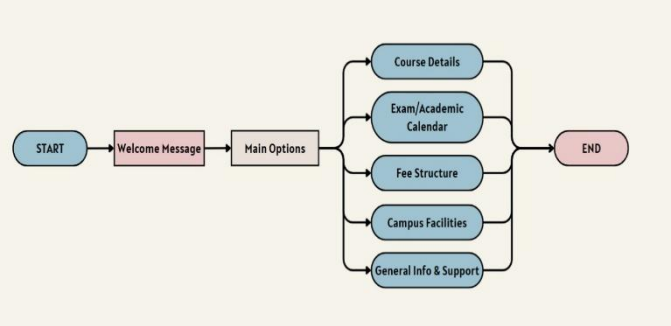


**Fig –3.2**: System Architecture of Chatbot

#### 3.2.1. User Flow and Navigation

The chatbot interaction begins with the START node, where the user enters the system. The chatbot initiates engagement by displaying a Welcome Message, serving as an introductory interface to guide users. Users are then directed to the Main Options menu, which acts as the primary navigation hub.

This menu provides structured access to five core functionalities, enabling users to retrieve relevant information efficiently.

**3.2.2. Functional Modules**
The Main Options menu branches into distinct functional modules that cater to various user inquiries:

- ✓ Course Details: Displays information about academic programs, syllabi, and available courses.
- ✓ Exam/Academic Calendar: Provides exam schedules, academic timetables, and important institutional deadlines.
- ✓ Fee Structure: Offers insights into tuition fees, available payment methods, and scholarship-related financial assistance.
- ✓ Campus Facilities: Highlights campus infrastructure, student amenities, and support services available.
- ✓ General Info & Support: Includes frequently asked questions (FAQs), contact information, and general assistance for students. Each module is designed to deliver concise and relevant information while ensuring ease of access.

**3.2.3. End of User Interaction**
Once the user obtains the required information, they reach the END node, signifying the conclusion of their session. If further assistance is needed, users can navigate back to the Main Options menu or restart their interaction.

**3.2.4. System Design Considerations**
To ensure an efficient and scalable chatbot system, the following design principles are followed:

- ✓ User-Centric Navigation: The chatbot provides a seamless, intuitive experience with minimal effort required from users.
- ✓ Modular Structure: Each functional area is well-defined, allowing users to retrieve information quickly and efficiently.
- ✓ Scalability & Future Expansion: The architecture supports the addition of new functionalities, such as student login, result inquiries, notifications, and personalized interactions.

This structured design ensures that the chatbot effectively meets user needs while maintaining flexibility for future enhancements.

## 4. METHODOLOGY

### 4.1 Website

**4.1.1. Problem Definition:**
The existing website of Government College of Engineering, Chandrapur (GCOEC) presents several usability challenges, making it difficult for students to efficiently access vital information such as schedules, course details, and administrative procedures. The current navigation structure is not intuitive, leading to increased time spent searching for essential resources. To enhance user experience, a redesign is proposed to improve accessibility, usability, and ease of navigation.

**4.1.2. Frontend Development** - A responsive and intuitive user interface (UI) developed using React.js, ensuring a smooth user experience across various devices.

**4.1.3. Backend Development -** A robust backend powered by Node.js and Express.js, handling data processing, API requests, and business logic implementation.

**4.1.4. Database Design and Implementation** - MongoDB is employed as the database solution, enabling flexible and scalable storage for user data, grievances, feedback, and other institutional information.

**4.1.5. User Authentication and Authorization** -
A secure login system is integrated to authenticate and authorize users efficiently. This ensures restricted access based on user roles, allowing students, faculty, and administrators to interact with the system within their permitted scope.

**4.1.6. Integration of Additional Modules** - To further enhance the functionality of the website, additional modules are incorporated:

- ✓ Grievance System - Students can submit grievances through the portal, while administrators can review and resolve these grievances upon logging in with their credentials.
- ✓ Training and Placement Feedback System - Students can provide feedback regarding training and placement experiences. The admin panel allows authorized personnel to view, filter, and analyze feedback based on date, month, and year.

**4.1.7. Testing and Quality Assurance**
A comprehensive testing strategy is employed to ensure the reliability, functionality, and security of the website. This includes:

- ✓ Unit Testing - Evaluating individual components and modules.
- ✓ Integration Testing - Ensuring smooth interaction between frontend, backend, and database.
- ✓ User Acceptance Testing (UAT) - Gathering feedback from students and faculty to refine usability.
- ✓ Security Testing - Identifying and mitigating vulnerabilities to safeguard user data.

**4.1.8. Deployment and Hosting**
The deployment strategy follows a cloud-based approach to ensure high availability and scalability:

- ✓ Backend Deployment - Hosted on Vercel and Strapi, providing a secure and efficient backend environment.
- ✓ Frontend Deployment - Also deployed on Vercel for a seamless and responsive user experience.

**4.1.9. Maintenance and Updates Post** - deployment, the system undergoes regular maintenance and updates to enhance performance and security. Continuous monitoring, bug fixes, and feature enhancements ensure that the website remains up-to-date with evolving user needs and technological advancements.

### 4.2 Chatbot

#### 4.2.1. Problem Definition

The primary goal of the chatbot is to automate responses to frequently asked questions related to admission processes, eligibility, courses, exam schedules, fees, campus facilities, and general information. This reduces administrative workload and enhances user experience.

#### 4.2.2. System Design

The chatbot is designed using Natural Language Processing (NLP) within the Botpress framework, ensuring intelligent and context-aware responses.
Components:

- ✓ User Interface (UI): A web-based chat interface embedded in the college website.
- ✓ Intent Recognition: Uses NLP techniques to understand user queries.
- ✓ Knowledge Base: A structured FAQ bank that contains predefined responses to common queries.
- ✓ Flow-based Navigation: Users interact through guided flows that lead to structured responses.
- ✓ Session Management: Ensures smooth transitions and maintains context during user interactions.

#### 4.2.3. Data Collection & Knowledge Base Development

A comprehensive FAQ bank is created by gathering relevant information from official college resources, including:

- ✓ College website and brochures.
- ✓ Academic and administrative departments.
- ✓ Student feedback on common inquiries.

#### 4.2.4. Natural Language Processing (NLP) Implementation

- ✓ Tokenization & Intent Matching: The chatbot breaks down user queries and matches them to predefined intents.
- ✓ Entity Recognition: Extracts key details (e.g., course names, fee amounts, deadlines) from user inputs.
- ✓ Fallback Handling: If a query is unclear, the chatbot prompts the user to rephrase or provides alternate resources.

#### 4.2.5. Development & Integration

- ✓ Botpress Framework Setup: The chatbot is built using Botpress, an open - source chatbot development platform.
- ✓ Training the Model: The chatbot is trained with various user inputs to improve response accuracy.
- ✓ Integration with Website: The chatbot is embedded as a widget on the college website for seamless access.

#### 4.2.6. Testing & Optimization

- ✓ Unit Testing: Individual chatbot functions are tested for correctness.
- ✓ User Testing: Real students and staff interact with the chatbot to identify improvements.
- ✓ Performance Optimization: Enhancements are made based on feedback, improving response time and accuracy.

#### 4.2.7. Deployment & Maintenance

- ✓ Deployment on College Website: The chatbot goes live for student interactions.
- ✓ Monitoring & Updates: The FAQ bank and NLP model are updated periodically to reflect new queries and institutional changes.
- ✓ Scalability Considerations: Future features, such as student login, exam results, and personalized assistance, can be added.

## 5. RESULT & IMPROVEMENTS

In the digital age, an institution's website serves as a crucial platform for communication, academic support, and administrative processes. This paper explores the integration of modern UI/UX design, advanced navigation, AI-powered features, and security enhancements to optimize a college website's performance and usability. The proposed improvements focus on accessibility, efficiency, and engagement, ensuring a seamless experience for students, faculty, and alumni.

### 5.1. Improved UI/UX Design

A modern, visually appealing, and user-friendly interface enhances accessibility and responsiveness. The website will be developed using Bootstrap and Tailwind CSS to ensure seamless compatibility across devices. A structured menu and breadcrumb navigation will provide a consistent and intuitive browsing experience.

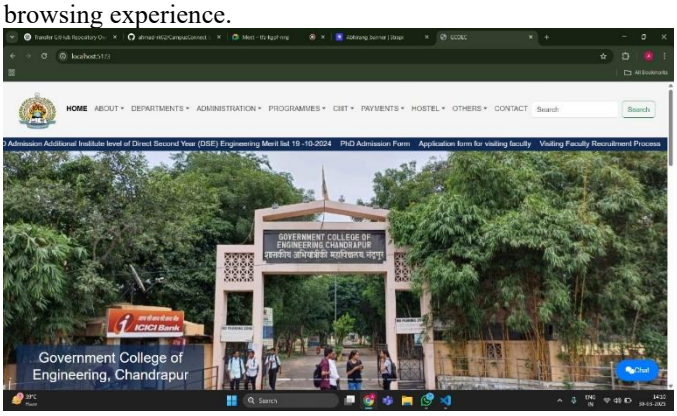


**Fig –** Website Homepage

### 5.2. Navigation

An optimized navigation system will allow users to access relevant information effortlessly. Dropdown menus will be structured department-wise for easy access. A quick links section will direct users to frequently visited pages like admissions, notices, and academic calendars. A mega menu will categorize content for improved user flow.


**Fig --** Search and Announcement Bar

### 5.3. Search and Announcement Bar

A dedicated search functionality and real-time announcement system will ensure efficient information retrieval. Elasticsearch

will be used for fast and accurate search results. A dynamic announcement bar will display critical academic updates, ensuring users stay informed in real time.

### 5.4. AI-Powered Chatbot

A chatbot will provide instant support to students, faculty, and visitors. Natural Language Processing (NLP) will facilitate AI-based conversational assistance. The chatbot will be trained with FAQs to offer quick responses and will ensure round-the-clock automated support.

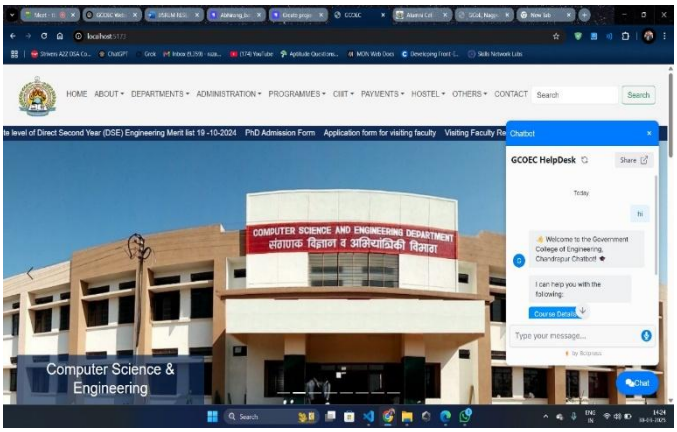


**Fig –** Chatbot

### 5.5. Enhanced Event Visibility & Accessibility

An improved event carousel will enhance the visibility of institutional events. The redesigned event carousel will feature smooth scrolling and dynamic content loading. User engagement analytics will track interactions, helping optimize event presentations based on popularity.

### 5.6. Integration of Alumni Platform

A dedicated alumni portal will foster networking, mentorship, and job opportunities. Alumni will have a registration system to update their professional details. A job board and mentorship section will enable alumni to post opportunities and offer guidance. Discussion forums will provide an interactive space for alumni engagement.

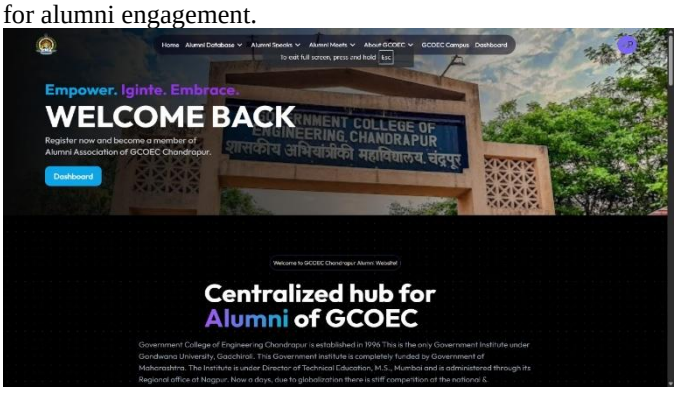


**Fig –** Alumni Platform

### 5.7. Digitalized Administrative Processes

Key administrative tasks such as fee payment and grievance redressal will be automated. E-forms will enable digital submissions, reducing paperwork. A secure online fee payment gateway will be integrated. A ticket-based grievance redressal system will streamline issue resolution.

### 5.8. Mobile Responsiveness & Performance Optimization

Ensuring fast loading speeds and mobile accessibility is crucial for user engagement. Lazy loading will improve speed by loading images only when needed. CDN integration will enhance performance and reduce server load. A mobile-first approach will optimize the browsing experience on smartphones and tablets.


**Fig –** Website mobile view

### 5.9. Secure Login System

A secure authentication system will protect user data and restrict unauthorized access. Role-based access control will ensure that only authorized users can view certain content. Two-factor authentication (2FA) will add an extra security layer for sensitive operations. Secure session management will use token-based authentication to prevent breaches.

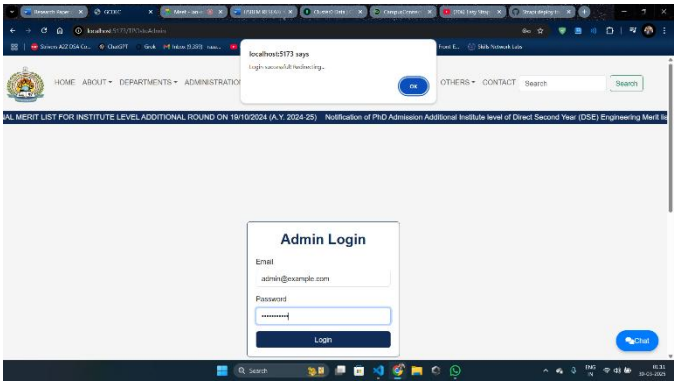


**Fig –** Secure Login System

### 5.10. Integration of Key Academic & Administrative Modules

Additional sections will be added to improve accessibility to essential academic and administrative information. The navbar will include direct links to hostel and CIIIT sections. A dedicated workshop page will showcase past and upcoming events. Secure payment gateway links will facilitate seamless transactions. An alumni website link will enable extended connectivity within the institution's network.

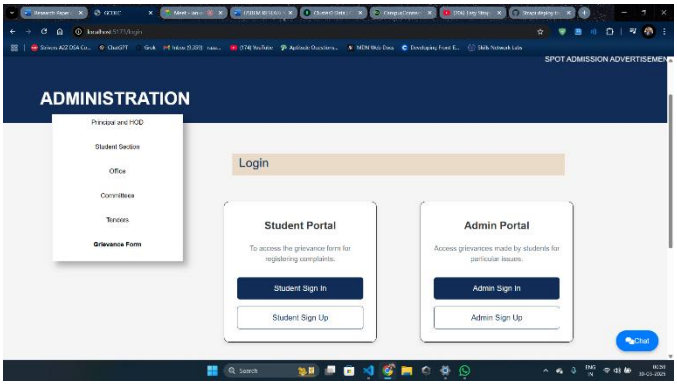


**Fig –** Admin module

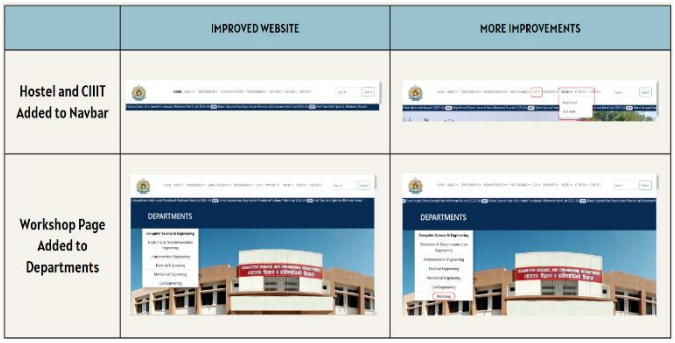


Fig – Addition of pages in Navbar

### 5.11. Comparative Analysis of the Old and New Website

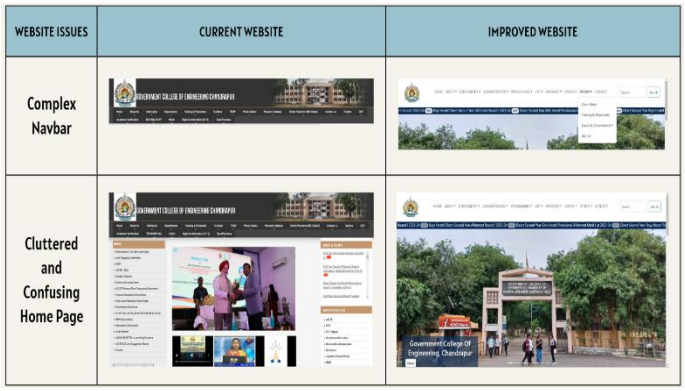


Fig – Comparison of Navbar, Homepage

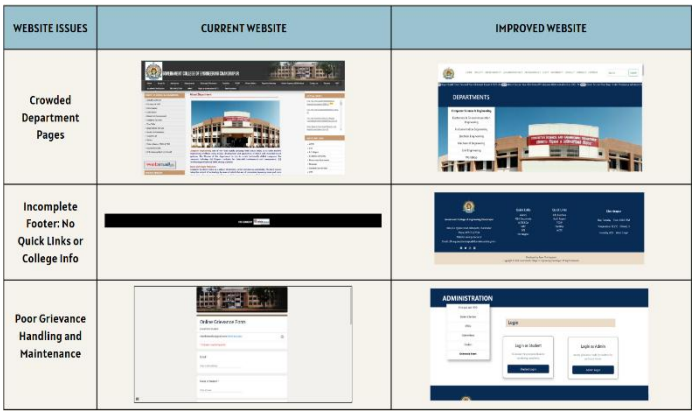


Fig – Departments, Footer, Grievance


Fig – Website Responsiveness

## 6. CONCLUSION

The modernization of the Government College of Engineering, Chandrapur (GCOEC) website using the MERN stack and an AI-powered chatbot has significantly enhanced its usability, efficiency, and user engagement. By addressing key challenges such as complex navigation, outdated design, and manual inefficiencies, the new platform provides seamless access to academic and administrative resources.

The integration of a Content Management System (CMS) enables faculty and administrators to manage and update content effortlessly, ensuring real-time accuracy and relevance. Additionally, the AI chatbot enhances user experience by offering instant, 24/7 assistance, reducing the dependency on manual support and streamlining information retrieval.

With a strong emphasis on security and accessibility, the new system ensures a safe, inclusive, and scalable digital environment. Its robust architecture not only meets current institutional needs but also allows for future expansions, such as personalized student portals and automated notifications.

Ultimately, this transformation strengthens GCOEC's online presence, fostering a more connected, efficient, and technology-driven academic ecosystem that benefits students, faculty, and stakeholders alike.

## 7. FUTURE SCOPE

Website Enhancements:

- ✓ Multilingual Support – Expanding accessibility by offering content in multiple languages.
- ✓ Personalized User Experience – Implementing AI-driven recommendations based on user behaviour.
- ✓ Integration with Academic Portals – Linking with student portals for real-time academic updates.
- ✓ Mobile App Development – Creating a mobile-friendly application for better accessibility.
- ✓ Advanced Analytics – Using AI-based analytics to track user interactions and improve engagement.

Chatbot Enhancements:

- ✓ Voice-Based Assistance – Enabling voice interactions for a more intuitive user experience.

- ✓ Expanded Knowledge Base – Continuously updating with more FAQs and academic resources.
- ✓ Interactive Workflow Automation – Automating administrative tasks such as form submissions and reminders.

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