GROUP 4 - WEB DEVELOPMENT: MECHATRONICS DEPARTMENTAL WEBSITE

BY

MECHATRONICS ENGINEERING

COLLEGE OF ENGINEERING

BELLS UNIVERSITY OF TECHNOLOGY-NEW HORIZONS

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INTRODUCTION TO PYTHON PROGRAMMING

(ICT 323)

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ABSTRACT

This project is a departmental website for the Department of Mechatronics Engineering at the College of Engineering, Bells University of Technology, Ota.

The website features several sections, including a Home page, which provides an introduction to the Mechatronics Engineering Department and essential information that portrays the department's image to visitors. It also includes a welcome address from the Dean, a News module to showcase recent activities and events within the department, an About page, and a Contact page to enable communication with the department.

In summary, the purpose of the website is to serve as a virtual platform connecting the department and students, ensuring everyone stays informed about departmental news and updates.

CHAPTER ONE

INTRODUCTION

1.1. Definition of a Website

1.1.1. What is a website?

A website is a place on the internet where you can easily post information about yourself, your business or topics you're passionate about. It's like having your own corner of the web to showcase your ideas and connect with others. Whether you're looking to share knowledge, sell online, communicate with others, learn something new or simply have fun—websites serve a variety of purposes. To access a website, users simply need a device with a web browser—like laptops, smartphones or tablets—along with an Internet connection.

1.1.2. What are websites used for?

From personal blogs to e-commerce stores, websites have become a crucial part of our routines, offering convenience and accessibility. Whether it's for entertainment, education, or business, websites are digital platforms that enable communication, information sharing, and online transactions.

Websites can be used for **personal purposes**, such as blogging or sharing information about hobbies and interests.

For businesses, a website serves as an online storefront where customers can view products or services, make purchases and reach out for customer support.

They are also commonly used for **education purposes**, with many schools and universities having their own websites to share information and resources with students.

Additionally, organizations and nonprofits use websites to raise awareness about their causes and connect with potential donors.

1.1.3. How does a website work?

The first thing to understand is the internet and the web that provide a ground for websites. The internet is the technology or infrastructure connecting computers and facilitating information sharing. The web is the system that enables information sharing using the internet. It encompasses digital documents, websites, webpages, media and more. To view web content, we use web browsers like Google Chrome, Internet Explorer, Microsoft Edge, Mozilla Firefox or Safari.

When you enter a web address or domain name into your browser, your computer sends a request to the hosting server. This request passes through the Domain Name System (DNS) to look up the server's internet protocol (IP) address. The web service uses protocols like Hypertext Transfer Protocol (HTTP), Hypertext Transfer ra Secure (HTTPS) and File Transfer Protocol (FTP) to transmit information and files over the web.

Once the server receives the request, it sends back the requested webpage, along with images and other files, to your computer. The browser then displays the webpage using technologies like HyperText Markup Language (HTML) and Cascading Style Sheets (CSS). These technologies structure and present the information on the screen. Website loading time depends on a range of factors like server speed, internet connection quality and website size and complexity.

1.2. What is Web Development?

Web development, also known as website development, refers to the tasks associated with creating, building, and maintaining websites and web applications that run online on a browser. It may, however, also include web design, web programming, and database management.

Web development is closely related to the job of designing the features and functionality of apps (web design). The term development is usually reserved for the actual construction of these things (that is to say, the programming of sites).

The basic tools involved in web development are programming languages called HTML (Hypertext Markup Language), CSS (Cascading Style Sheets), and JavaScript. There are, however, a number of

other programs used to “manage” or facilitate the construction of sites that would otherwise have to be done “from scratch” by writing code. A number of content management systems (CMS) fall into this category, including WordPress, Joomla!, Drupal, TYPO3, and Adobe Experience Manager, among others.

1.3. Background of the Project

A departmental website can help a department establish an online presence, share information and connect with students in the department from all levels. It can help to disseminate information regarding the department and also the college as a whole.it can also help the students and lecturers connect and interact better fostering better relationships between them. It can also enlighten the students of the cores, values and vision of the department.

1.4. Problem Statement

The lack of a dedicated and efficient departmental website for the Department of Mechatronics Engineering at Bells University of Technology has resulted in a few challenges for students and staff. Important information such as course details, staff profiles and departmental activities and announcements are difficult to access.

This lack of adequate information leads to various problems, such as;

- The staff and students face difficulties finding accurate information about academic programs, events and deadlines.
- The absence of a website discourages interactions within the department
- The department’s achievements and events are not adequately showcased affecting its reputation.
- Reliance on manual or offline methods for processes reduces efficiency.

A well-designed website solves these problems by acting as a central platform for disseminating information, improving accessibility and operational efficiency for all users.

1.5. Objectives of the Project

The main purpose of this departmental website is to improve accessibility, providing students with relevant information and news in the department, connecting the department with the students, building a responsive and user-friendly website and showcasing departmental activities.

1.6. Scope of the Project

The scope of this project is to disseminate information, meet accessibility standards, create a user-friendly interface for easy navigation and support multiple types of context like text, videos,images,etc.

Some of the limitations of the project include, budget restraints, time constraints, technical expertise, maintenance, content quality, scalability, accessibility limitations, user feedback implementation and testing scope.

CHAPTER TWO

METHODOLOGY

2.1. Frontend Development Process

2.1.1. Frontend Design

The website’s frontend will be designed using HTML, CSS, and JavaScript. The layout will be responsive, ensuring compatibility with a variety of devices, including desktops, tablets, and mobile phones. A clean and intuitive design will be prioritized, with easy navigation and fast access to information.

1. **User Features**
    - **Homepage**: A welcoming page with department news, announcements, and quick links to essential resources.
    - **About**: This section provides detailed information about the Mechatronics Engineering Department, its history, mission, vision, and goals. It also includes information about faculty members, achievements, and departmental initiatives.
    - **Contacts Us**: A section with a form for inquiries, allowing users to contact the department directly. This section also integrates an interactive map showing the department's location, making it easier for visitors to find the department.
    - **Program and Courses**: A form for inquiries with integration of an interactive map for department location.
    - **Staff and Student resources**: Information on admissions, programs, and application processes.

2. **Additional Functionalities**
    - **News and Announcements Section**: A dedicated section for the department's news, updates, and notifications.
3. **Limitations**
    - The website will not include advanced features like real-time notifications or a mobile app in this initial version.
    - Only basic content management will be available to department staff, with future plans for more advanced administrative capabilities.

Homepage

The homepage serves as the central hub of the departmental website, providing a welcoming and informative interface. Key features include:

- **Department News**: Regular updates on department activities, achievements, and events.
- **Latest Updates**: Important notifications such as exam schedules, deadlines, and departmental policies
- **Quick Links**: Easy access to essential resources like course registration, academic calendars, and departmental guidelines.

About

The "About" section offers comprehensive insights into the Mechatronics Engineering Department. It includes:

- **Department History**: A brief history of the department, highlighting its growth and milestones.

- **Mission and Vision**: The department's mission and vision statements, showcasing its commitment to excellence.
- **Faculty and Achievements**: Profiles of faculty members, their research areas, and notable departmental achievements.
- **Departmental Initiatives**: Ongoing and upcoming projects, collaborations, and initiatives that the department is involved in.

Contact Us

The "Contact Us" section facilitates easy communication with the department. It features:

- **Inquiry Form**: A user-friendly form for students, prospective students, and external stakeholders to submit inquiries or feedback.
- **Interactive Map**: Integration of a map to help users locate the department's physical office, ensuring easy navigation for visitors.

Programs and Courses

This section provides dynamic access to the department's academic offerings, including:

- **Program Information**: Detailed descriptions of undergraduate and postgraduate programs, including specializations and curriculum structure.
- **Course Listings**: A comprehensive list of courses offered, complete with descriptions, prerequisites, and credit hours.
- **Class Schedules**: Up-to-date class schedules that students can view and plan their academic activities.
- **Registration System**: An online system that allows students to register for courses directly through the website, streamlining the enrollment process.

Staff and Student Resources

This section acts as a repository of valuable resources for both staff and students. Features include:

- **Admissions Information**: Guidelines and requirements for prospective students looking to join the department.
- **Academic Resources**: Access to downloadable materials such as academic calendars, policies, and forms necessary for academic and administrative processes.
- **Support Services**: Information on available support services, including counseling, academic advising, and career services.

2.2. Backend Development Process

This section covers the backend setup process for the project, where **Django**, a powerful Python web framework, was integrated to manage the application's backend. We also incorporated **Git** and **GitHub** for version control, ensuring smooth development and collaboration. The backend's primary goal was to set up a solid framework for further development, without delving into creating APIs or advanced features just yet.

2.2.1. Setting Up the Django Backend

The backend development began by setting up **Django** as the core of our project. Django is a high-level Python framework that simplifies web application development by providing built-in tools for handling common web development tasks such as database interaction, authentication, and security.

Creating a New Django Project

The first step in the backend setup was initializing a new Django project. This was achieved by using the following command in the terminal:

bash

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django-admin startproject projectname

This command generated the initial project folder, complete with the default configurations and file structure needed to start building the backend.

Django Settings Configuration

The settings.py file inside the Django project was edited to adjust settings according to the project's requirements. Key changes included configurations for database connections, security settings (like SECRET_KEY), and middleware. Additionally, this file is where we defined the installed applications, such as Django's built-in admin and the app we created for further development.

2.2.2. Installing Required Packages

To add functionality to our Django project, several packages were installed. These packages help improve development efficiency, handle various media types, and ensure seamless integration with other services.

The key packages installed include:

- **Django Rest Framework**: Initially installed for future use, though we have not yet built APIs.

- **Pillow**: For image handling, which is useful when working with media files in the backend.
- **psycopg2**: This package allows Django to communicate with PostgreSQL, a relational database management system chosen for the project's database.

The installation was carried out using the following command:

bash

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pip install django djangorestframework Pillow psycopg2

2.2.3. Database Configuration

For the project's database, **PostgreSQL** was selected due to its robust performance, especially for larger projects. Django's settings were configured to integrate seamlessly with PostgreSQL by modifying the DATABASES setting in the settings.py file:

python

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```
DATABASES = {
    'default': {
    'ENGINE': 'django.db.backends.postgresql',
    'NAME': 'projectname',
    'USER': 'dbuser',
```

```
        'PASSWORD': 'dbpassword',
        'HOST': 'localhost',
        'PORT': '5432',
        }
}
```

This setup ensured that Django communicates with PostgreSQL to manage all data-related activities such as creating, updating, and deleting records from the database.

2.2.4. User Authentication Setup

Although we didn't create any advanced APIs, we set up basic user authentication for the project, enabling us to manage user registrations and logins. Django comes with built-in authentication features, which were configured to handle user management.

Authentication Settings

We utilized Django's default authentication system, which includes views for logging in, logging out, and managing user sessions. The authentication system was configured in settings.py to ensure security features like password hashing and user session handling.

2.2.5. Setting Up Version Control with Git and GitHub

Version control was essential for the backend project's development process. We used **Git** for local version control and **GitHub** for cloud-based repository hosting. This setup ensured that we could track changes, collaborate efficiently, and store the code in a central location.

Initializing the Git Repository

The first step was to initialize a Git repository in the project directory using:

bash

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git init

This created a .git directory, enabling us to track changes in the project.

Creating a Remote Repository on GitHub

We then created a remote repository on **GitHub** to store the project code. After the repository was created on GitHub, we linked the local repository to GitHub by adding the remote URL:

bash

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git remote add origin https://github.com/username/projectname.git

This allowed us to push and pull changes from the remote repository to sync the local development environment with the cloud version of the project.

Committing Changes to Git

Changes to the project were staged and committed using Git. The following commands were used to track the changes:

1. **Staging the changes**:

bash

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git add .

2. **Committing the changes**:

bash

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git commit -m "Initial commit: Set up Django project and database"

3. **Pushing changes to GitHub**:

bash

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git push origin main

Pulling Changes from GitHub

When working on the project across different devices or with collaborators, we regularly pulled changes from the remote repository using:

bash

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git pull origin main

2.2.6. Testing and Debugging the Backend

Though we didn't focus on API creation or complex backend features, basic testing was done to ensure that the Django setup worked as expected. This included testing user authentication features and verifying that the database connection was functioning correctly.

Django's built-in test framework was used for testing, ensuring that the project could be easily extended later with more complex features and functionality.

2.2.7. Deployment and Future Steps

At this stage, the backend is set up and ready for further development, such as creating APIs, adding more functionality, and handling other features like file uploads or third-party integrations.

For deployment, we planned to use platforms like **Heroku** or **AWS** for hosting the Django project, which will be the next step after further development. Continuous integration tools like **GitHub Actions** will be implemented later to automate testing and deployment processes.

Conclusively, the backend setup process has laid a strong foundation for future development. By creating a Django project and configuring the necessary tools, databases, and version control systems, the project is now prepared for further enhancements. The focus moving forward will be on building out additional features, including APIs, and refining the backend to support the project's future needs.

2.3. Features of the Website

The features of the website include:

- Home Page
- Welcome Address
- News Module

- About
- Contact Page

CHAPTER THREE

3.1. Challenges Faced

3.1.1. Navbar and Footer Consistence

Ensuring the navbar and footer remain consistent across all pages without repeating code was a significant challenge. Initially, duplicating the navbar and footer code on each page led to issues with maintainability and consistency. To resolve this, we explored the use of template files or reusable components, which helped streamline updates and maintain uniformity across the website. Javascript was used to fetch the navbar and footer HTML files separately to avoid repeatability in the code.

3.1.2. Responsive Design Issues

Another problem encountered was ensuring the layout adapted properly across different screen sizes. Some elements, especially images and grid layouts, did not behave as expected on smaller devices. This required extensive testing and adjustments in CSS media queries to ensure a responsive design.

3.1.3. Image Loading Errors

There were instances where images did not load correctly due to incorrect URLs or permissions. Ensuring all images were correctly sourced and accessible was crucial for a seamless user experience.

3.2. Future Recommendations

The departmental website could do with some additional features to increase efficiency, such as:

- Establishing a schedule for updating the website with news, events and announcements to keep it relevant and engaging.
- Integrating the website with student portals for personalised access to academic resources, results and schedules
- Enabling access to lecture materials, assignments and recorded sessions.
- Implement a feedback system for users to suggest improvements or report issues.
- Upgrade security protocols to safeguard user data, including two-factor authentication for login areas and periodic vulnerability assessments.

3.3. Conclusion

The development of the [Department Name] website marks a significant step forward in enhancing communication, accessibility, and engagement within the department. By addressing the existing challenges of information dissemination and user interaction, the website serves as a centralized platform for students, faculty, and external stakeholders to access accurate and timely information.

This project has successfully laid the foundation for a modern, user-friendly, and scalable digital presence that reflects the department's values and achievements. While there were challenges during the development process, such as content organization and technical constraints, these were overcome through effective planning, collaboration, and problem-solving.

The website not only fulfills its primary objectives but also creates opportunities for future growth, including the integration of advanced features, enhanced accessibility, and better user

engagement. Regular updates, feedback implementation, and continuous improvements will ensure the website remains relevant and valuable for all its users.

In conclusion, this initiative demonstrates the department's commitment to leveraging technology to improve its operations and outreach, fostering a more connected and informed academic community.

3.4. Appendices

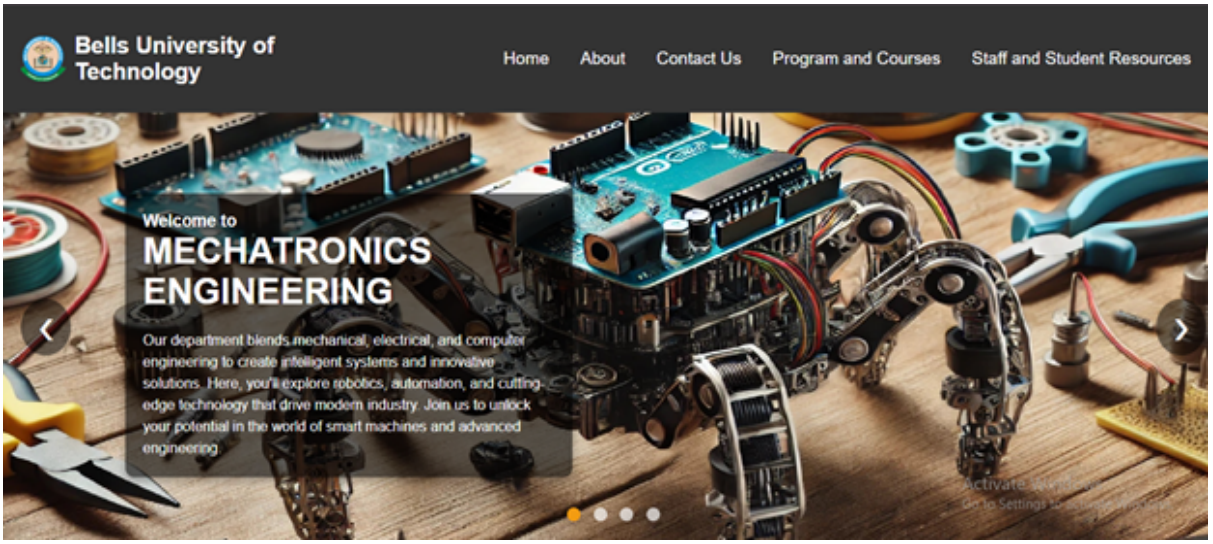

Figure 1: Home Page

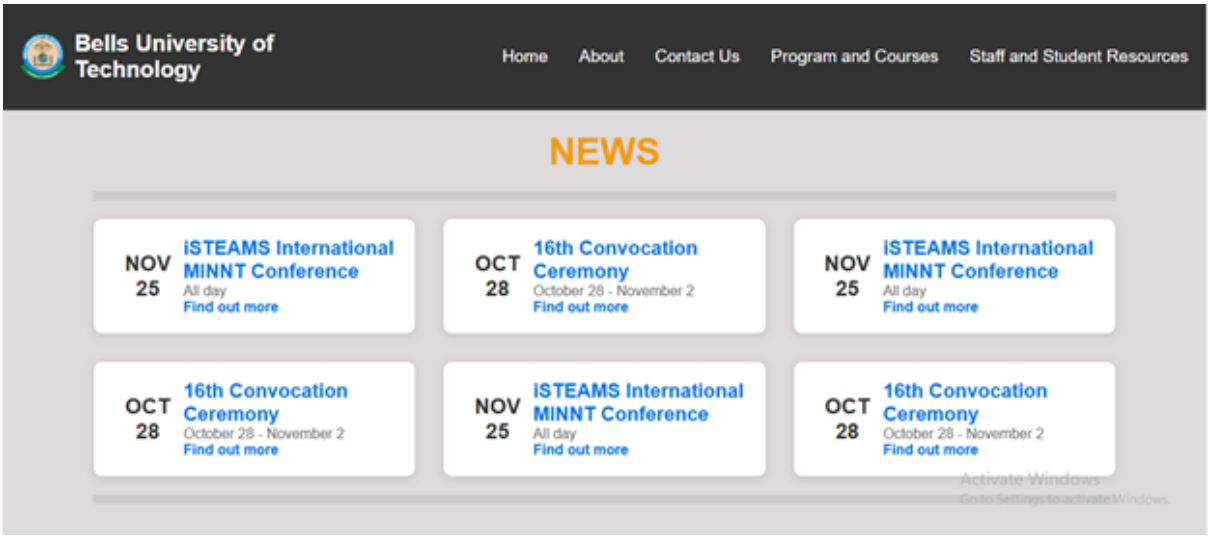

Figure 2: Department News

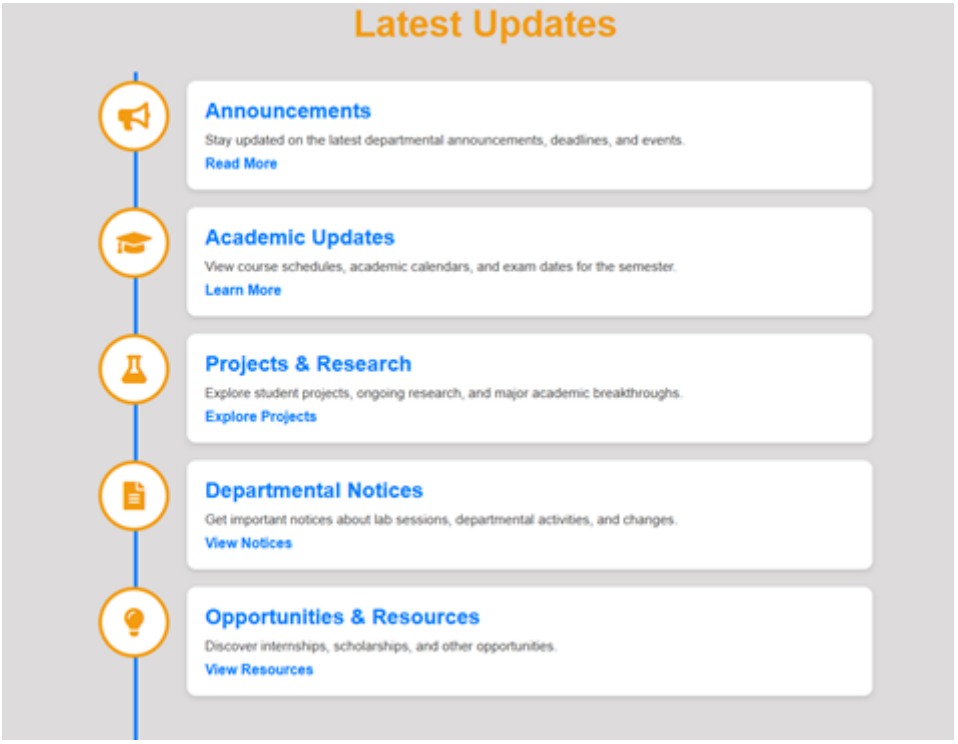

Figure 3: Latest Updates

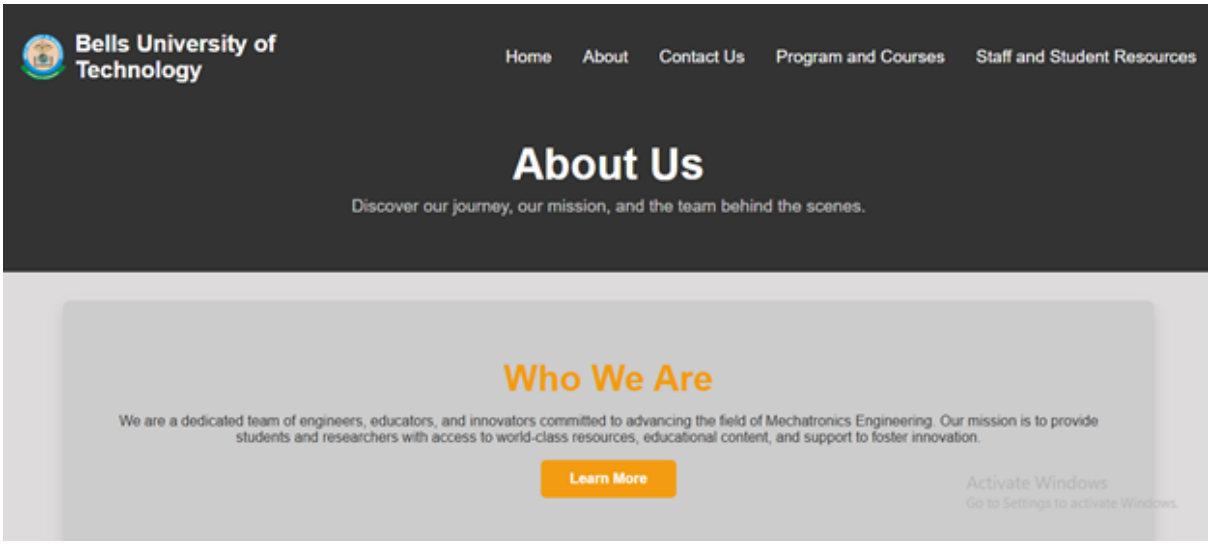

Figure 4: 'About' Section

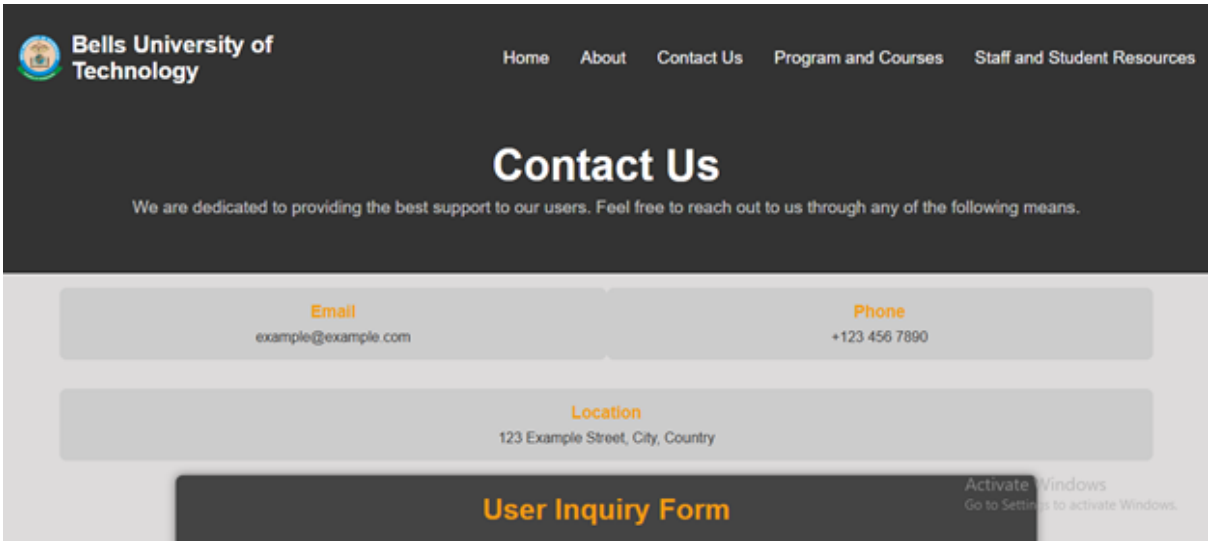

Fig. 5: 'Contact Us' Section

Fig. 6: Code Snippet used to fetch the navbar and footer html files separately to avoid repeatability

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