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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1. BACKGROUND:**

"In the ever-evolving of contemporary higher education, institutions are constantly striving to improve their academic frameworks in order to meet the changing requirements of students and the professional world." At Bannari Amman Institute of Technology, the introduction of one-credit courses and the establishment of elective course exemption policies are pivotal components of our commitment to providing a holistic and adaptable educational experience. In addition to the traditional curriculum landscape, one-credit courses, which are typically taught by seasoned industry professionals over the weekend, provide students with practical insights and hands-on experience in specialized fields. Students will gain essential skills and improve their employability by taking these courses, which aim to bridge the gap between theoretical knowledge and practical application. Another essential component of our educational strategy is the policy on elective course exemption, which enables students to tailor their academic pathways by recognizing and validating previous learning experiences. Students can get credit for certifications like NPTEL courses, substantial internships, successful completion of honor/minor programs, and the accumulation of one-credit courses thanks to this policy, which acknowledges the various learning paths students take. This flexibility not only enhances student autonomy but also fosters a culture of lifelong learning and continuous professional development.

Paper-based forms, Google Forms for initial registrations, and manual record-keeping for attendance, assessments, and exemption requests have all been used in the administrative management of these initiatives in the past. Despite the fact that these strategies have served their purpose, they are becoming increasingly insufficient in light of the expanding number of students and academic offerings. The manual nature of these processes leads to inefficiencies, delays, and a

heightened risk of human error. As more and more educational establishments around the world embrace digital transformation, BIT must move away from its antiquated manual processes and toward a more cutting-edge, technology-driven strategy. This change is in line with our overarching objective of using technology to improve administrative efficiency, data accuracy, and, ultimately, the student experience as a whole."

## **1.2 PROBLEM DEFINITION:**

"The central challenge that this project aims to address is the inherent inefficiency and potential for errors associated with the current manual system used for managing one-credit course registrations and elective course exemptions at BIT. In particular, the following problems have been discovered: Manual Registration and Scheduling Is Inefficient: The use of Google Forms for course registration and manual scheduling adds a lot of administrative overhead, takes longer to process, and increases the likelihood of scheduling conflicts. As the number of students enrolled and the number of courses offered increases, this manual method is not scalable and becomes increasingly cumbersome. Human error can cause inaccuracies in student records and delays in providing timely feedback due to the manual tracking of attendance and assessment marks. Error-Prone Manual Assessment and Attendance: This process is time-consuming for trainers and administrative staff, diverting their attention from more strategic tasks.

The paper-based exemption request procedure is characterized by its complexity, lack of transparency, and extended processing times. It involves multiple approval authorities and physical form submissions. The exemption policy's overall efficacy is harmed, student progress is slowed, and bottlenecks are created by this procedure. Lack of Centralized Information and Tracking: Students lack a centralized digital platform to access and track their completed one-credit

courses, exemption request statuses, and related information. This absence of a unified system leads to confusion, frustration, and a lack of transparency.

**Absence of Personalized Course Recommendations:** The current system does not leverage data analytics or recommendation algorithms to provide students with personalized course suggestions based on their academic interests and career aspirations. This missed opportunity inhibits student engagement and prevents them from making educated choices regarding their academic paths. The cumulative effect of these issues is a system that is inefficient, error-prone, and ill-equipped to meet the evolving needs of students and the institution. As a result, a digital solution that streamlines these procedures, increases transparency, and enhances the user experience for all stakeholders is essential."

### **1.3. OBJECTIVES:**

"The primary goals of this project are as follows: to come up with an idea, create a design, and build a robust and easy-to-use web application that will manage the entire registration and exemption processes for elective courses and one-credit courses. to automate the registration and scheduling processes, minimizing the likelihood of scheduling conflicts and significantly reducing the amount of manual administrative work required. to set up a digital system that is both safe and effective for keeping track of attendance and recording assessments. This will make sure that the data are accurate and that student information can be processed quickly. to develop a straightforward and streamlined online exemption request module that will make it easier for relevant authorities to quickly process and approve student exemption requests. to create a centralized digital platform that gives students access to their completed one-credit courses, the status of their exemption requests, and other relevant data. To integrate a sophisticated recommendation engine that leverages student data and preferences to provide personalized course suggestions, enhancing student engagement and academic planning.

To enhance the overall efficiency, transparency, and user experience for all stakeholders, including students, trainers, administrators, and approval authorities, by transitioning from manual to digital processes."

#### **1.4. SIGNIFICANCE OF THE STUDY:**

"This project promises to revolutionize the management of one-credit courses and elective course exemptions, and it holds profound significance for BIT and its diverse stakeholders." The digitalization of these processes will yield numerous benefits, including:

Automation of manual tasks will free administrative staff from time-consuming routines, allowing them to concentrate on strategic initiatives and activities that add value. Digital record keeping will significantly reduce the risk of human errors associated with manual data entry, ensuring the accuracy and reliability of student records. This will improve data integrity and accuracy. Increased Transparency and Accountability: The online exemption request module will provide a transparent and auditable approval process, fostering accountability and building trust among stakeholders.

Enhanced Student Experience and Engagement: A user-friendly web application will empower students with easy access to course information, exemption statuses, and personalized recommendations, thereby enhancing their overall academic experience and engagement.

#### **1.5. SCALABILITY AND ADAPTABILITY:**

The digital system will be built to be scalable and adaptable. This will allow for an increase in the number of courses offered and the number of students enrolled, ensuring its long-term viability. Data-Driven Decision-Making: The centralized platform will provide valuable data and insights to students, administrators, and trainers, facilitating informed decision-making and strategic planning.

Alignment with Trends in Digital Transformation This project positions BIT as a forward-thinking institution dedicated to utilizing technology to enhance academic excellence and operational efficiency, aligning with the broader trend of digital transformation in higher education. This project will contribute to a more effective, transparent, and student-centered academic environment by addressing the limitations of the current manual system and fostering an environment of innovation and excellence."

## **CHAPTER 2**

### **LITERATURE SURVEY**

Managing one-credit courses and elective exemptions in academic institutions has become a focal area of research and development due to the increasing demand for streamlined and scalable academic workflows. Numerous studies have explored the challenges and solutions associated with course registration, attendance tracking, and academic performance evaluation. However, manual systems and fragmented tools such as Google Forms and spreadsheets continue to dominate, leading to inefficiencies and operational challenges. The inefficiencies of these systems highlight the pressing need for an integrated, automated solution to manage the entire workflow seamlessly.

Research by Bedford and Caulfield (2012) emphasized the drawbacks of manual systems in academic management. These systems often result in errors, delays, and significant administrative overhead. They are particularly ineffective in handling growing student enrollments, as the reliance on paper-based methods and non-integrated digital tools fails to provide scalability. Manual verification of attendance and exemption eligibility also consumes considerable time, reducing overall efficiency. These findings stress the need for an automated system capable of addressing the limitations of manual workflows.

The adoption of digital platforms for academic processes has been explored by Kumar (2024), who demonstrated the benefits of web-based frameworks in enhancing efficiency and scalability. Their study highlighted the importance of real-time updates in attendance and assessment records, which improve transparency for both students and administrators. However, existing solutions often fail to address the specific requirements of one-credit courses, such as tracking cumulative progress for elective exemptions. This limitation points to the need for a specialized system tailored to these unique academic workflows.

Davis et al. (2015) investigated the advantages of real-time data tracking

systems in educational institutions. Their research underscored the value of such systems in enabling students to monitor their academic progress and assisting administrators in making timely decisions. Despite these benefits, the study revealed that many systems lack comprehensive integration across various academic workflows. This results in the use of multiple disconnected tools, leading to inefficiencies and difficulties in managing student records and verifying eligibility for exemptions.

Singh (2024) explored the implementation of role-based access control (RBAC) mechanisms in academic systems, which enhance data security by restricting access based on user roles such as students, trainers, and administrators. While this approach ensures data security, their study identified a gap in combining RBAC with automated processes for tasks like exemption validation. This gap creates inefficiencies, as manual interventions are still required for verification and approval processes, which undermines the potential of automated systems.

Although existing literature highlights the benefits of digital solutions in academic workflows, several gaps remain unaddressed. Many systems fail to provide end-to-end integration, leading to fragmented processes that complicate data management. Sharma (2024) observed that even semi-digital systems often rely on manual verification of exemption eligibility, resulting in delays and errors. Furthermore, few solutions cater specifically to one-credit courses, which require tracking cumulative progress and automating validation processes to ensure seamless operations.

The reviewed literature demonstrates that while current digital systems have made strides in improving academic workflows, they often fall short in addressing the unique challenges posed by one-credit courses and elective exemptions. The lack of real-time data integration, automation in validation processes, and comprehensive role-based access control are significant limitations. Scalability and adaptability remain critical concerns, particularly for



institutions with growing student populations and course offerings. These findings underscore the need for a robust and user-friendly system that integrates all aspects of one-credit course management and elective exemptions into a single, cohesive platform.

The proposed solution addresses these gaps by developing a full-stack MERN application designed to digitize the management of one-credit courses and elective exemptions. The system will feature automated validation of cumulative course completion, real-time tracking of attendance and assessments, and role-based access control to ensure efficiency, transparency, and data security. By centralizing data and streamlining workflows, the system aims to overcome the challenges highlighted in the literature and provide a scalable, future-ready solution for academic institutions.

## **CHAPTER -3**

### **OBJECTIVES AND METHODOLOGY**

The "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" was born out of a strategic need to update the outdated administrative structure at the institution. The project's journey from the constraints of manual, paper-based processes to the dynamism of a sophisticated digital platform is meticulously charted in this chapter. A crucial realization of the existing system's inherent limitations and vulnerabilities prompted this shift. Manual handling of course registrations and exemption requests was not only time-consuming and labor-intensive but also prone to errors, inconsistencies, and delays. The strain placed on the administrative infrastructure became increasingly unmanageable as both the number of students enrolled and the variety of academic courses offered continued to rise. As a result, this project was more than just a technological upgrade; it was also a fundamental overhaul of administrative workflows. The project's core objectives were strategically aligned with the institution's broader vision of academic excellence and operational efficiency, and we undertook a rigorous process to define and refine them. These goals included making course registration more accessible and user-friendly, streamlining the process of requesting an exemption, and providing robust tools for administrators and instructors. Equally meticulous was the method used, which included a thorough examination of the existing procedures, precise gathering of requirements, iterative development, stringent testing, and seamless deployment. The structured approach taken to guarantee the project's success will be described in detail in this chapter, which will examine each phase of this methodology. In addition, it will place these technical procedures within the larger institutional objectives of improving student experience, giving faculty more control, and encouraging a culture of academic administration improvement. By providing a clear and detailed account of the project's

objectives and methodology, we aim to offer valuable insights into the strategic planning and execution involved in modernizing academic administrative systems, demonstrating how technology can be harnessed to create a more efficient, responsive, and student-centric educational environment.



**Figure 3.1 Paper Forms to Digitalization**

### **3.1 CORE OBJECTIVES AND INDIVIDUAL CONTRIBUTIONS:**

The primary objective of this project was to develop and implement a user-friendly, scalable, and student-focused web application that would revolutionize the administrative procedures at Bannari Amman Institute of Technology. A critical evaluation of the institution's existing manual administrative workflows revealed that they were becoming increasingly inefficient and error-prone. As a result, this initiative was born. The traditional paper-based system had become unsustainable due to the growing number of students and expanding range of academic offerings, necessitating a digital transformation. The primary operational objective was to develop a safe and user-friendly platform that would enable students to easily register for one-credit courses and keep track of their academic progress. This required the careful creation of a front-end interface that accommodated students with varying levels of technical proficiency and was

designed with accessibility and ease of use in mind. Students are able to select courses, view schedules, and access learning materials with a minimal cognitive load thanks to the user interface, which was designed to streamline the registration process. In parallel, a crucial objective was the creation of a specialized trainer module to alleviate course instructors' administrative burdens. The purpose of this module was to make it easier to keep track of course materials, attendance records, and assessment scores in one place, allowing teachers to concentrate on providing high-quality instruction. It provided trainers with all necessary tools by incorporating digital attendance tracking, automated grade calculation, and a centralized repository for course resources. In addition, the project aimed to implement a comprehensive administrative module that would give administrators the tools they needed to manage the system effectively. This module was designed to ensure the platform's smooth operation and long-term viability, incorporating features for adding new courses, assigning trainers, and maintaining the database. The administrative module was designed with usability and efficiency in mind, allowing administrators to carry out their duties quickly and accurately. A significant objective was the creation of an online exemption request module, designed to streamline the process of applying for and approving elective course exemptions. By enabling approval authorities to promptly process exemption requests and providing students with real-time updates on the status of their requests, this module aimed to improve transparency and efficiency. It ensured accountability and transparency by incorporating features like digital form submission, automated routing to relevant authorities, and a comprehensive audit trail. Finally, the project sought to integrate a sophisticated recommendation engine, providing students with personalized course suggestions based on their academic interests and career goals. This feature was designed to empower students to make educated choices about their academic paths and to increase student engagement. By utilizing collaborative filtering techniques and analyzing student data as well as course information, the recommendation engine generated

suggestions that were both relevant and individualized. To ensure the realization of these objectives, each team member was assigned specific goals, aligned with the project's overall aims and individual skill sets. To ensure a seamless user experience, one team member concentrated on developing the front-end interface and putting the student module into action. Another team member concentrated on developing the trainer module and the back-end API, ensuring the system's robust functionality. The final member of the team was in charge of the database design, back-end API development for the administrative module, and system architecture to guarantee the platform's scalability and maintenance.

### **3.2. SYSTEM DESIGN AND COMPONENT DEVELOPMENT:**

After the phase of gathering requirements was completed successfully, the project team moved on to the crucial design phase, which required careful planning and architectural foresight. This phase laid the groundwork for a robust and scalable application by creating a comprehensive system architecture and designing each component in detail. The platform was architected using a modular approach, ensuring that it could accommodate future expansions and adapt to evolving institutional needs. In order to improve maintainability and scalability, this required dividing the system into distinct, interconnected modules, each of which was responsible for a specific function. Utilizing the advantages of current web technologies, the architecture was built around a traditional client-server model. React.js was used to build the front-end because it has a component-based architecture and can make user interfaces that are dynamic and responsive. The back-end was built with Node.js and Express.js, providing a server-side environment that is quick and effective for managing business logic and API requests. MongoDB was selected as the database management system, offering a flexible and scalable NoSQL solution that could handle the diverse data requirements of the application.

A component-based design for the front end made it possible to create reusable UI components. This facilitated the development of a consistent and maintainable user interface, ensuring a seamless user experience across the application. In order to facilitate the system's integration with other applications or services and to adhere to industry best practices, the back-end APIs were designed with a RESTful architecture. User authentication, course registration, attendance management, assessment recording, exemption request processing, and administrative tasks are just a few of the functions that can be handled by these APIs. Each component was developed and tested independently using an iterative development approach before being integrated into the system as a whole. This made sure that each module worked right and met the requirements. To begin, robust user authentication protocols were developed to guarantee safe system access for students, teachers, administrators, and approval authorities. JSON Web Tokens (JWT), a stateless and secure mechanism for managing user sessions, were used to implement secure authentication. The development of the one-credit course registration module, which followed the authentication module, made it easier for students to register for courses and keep track of their academic progress. This module included features such as course search, schedule viewing, and registration confirmation, providing students with a streamlined and efficient registration experience. The implementation of the attendance and assessment management module empowered trainers to manage student records effectively and provide timely feedback. Trainers' administrative tasks were made easier by this module's inclusion of features like digital attendance tracking, automated grade calculation, and a centralized repository for course materials. The exemption request processing module was then developed, facilitating the efficient approval of student exemption requests. This module included features such as digital form submission, automated routing to relevant authorities, and a comprehensive audit trail, ensuring transparency and accountability. The administrative management module was created simultaneously, giving

administrators the tools they need to manage the database, trainers, and courses. This module included features such as user management, course creation, and database backup, ensuring the system's smooth operation and maintenance."

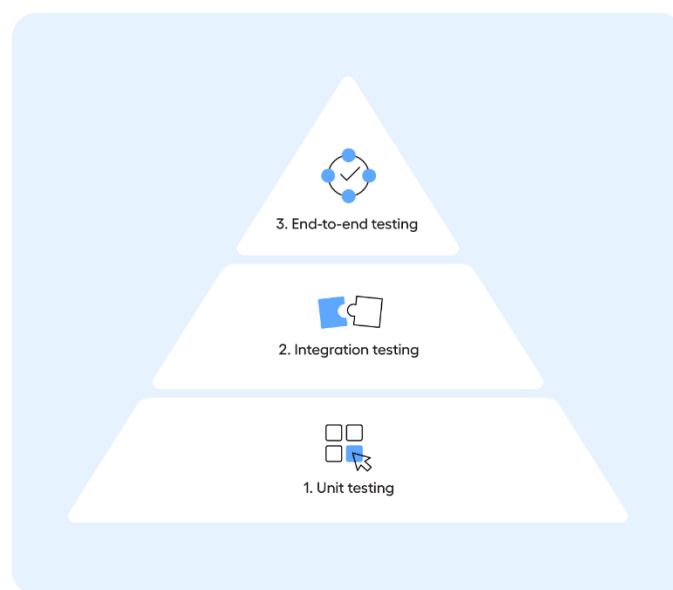
### **3.3. TESTING PROCEDURES:**

Throughout its development, the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM"'s highest standards of integrity and dependability were a top priority. To this end, a comprehensive testing strategy was meticulously designed and implemented, encompassing both unit testing and integration testing. Our testing strategy's foundation was unit testing, which focused on independently confirming each component's functionality. In order to test the code under a wide variety of input conditions and edge cases, comprehensive test cases were created for each function and module. By isolating and testing each component in this manner, we ensured that they performed as expected, minimizing the risk of unexpected behavior when the system was assembled.

We made use of Jest and Enzyme for the React.js frontend. We were able to thoroughly validate the behavior of our components because Jest provided a robust and adaptable framework for running tests and asserting expected outcomes. On the other hand, Enzyme made it easier to render and manipulate React components, allowing us to test the state and props of the components and simulate user interactions. We were able to thoroughly test our front-end using this set of tools, spotting potential issues early in the development process. By ensuring that each component functioned correctly in isolation, we significantly reduced the likelihood of module-specific bugs propagating to the integrated system.

Postman, a powerful tool that allowed us to send HTTP requests to the backend APIs and verify the responses, was used for API testing in addition to unit testing.

This was very important for making sure that our APIs worked as expected and met the requirements. We were able to save time and effort by identifying and resolving issues early in the development process thanks to Postman's ability to automate API testing and generate comprehensive reports. Integration testing was then performed to ensure that the various modules of the system worked seamlessly together. This involved testing the interactions between different components, such as the frontend and backend, the database and the APIs, and the various user modules. In order to replicate the intricate user interactions and workflows that the system would encounter in production, integration tests simulated real-world scenarios. For instance, tests were carried out to ensure that the trainer module correctly retrieved student registration data from the database and that the data flow between these components was accurate and dependable. Similarly, tests were performed to ensure that exemption requests were correctly routed to the appropriate authorities and that administrators could manage user accounts effectively, validating the system's ability to handle complex workflows and user permissions. This rigorous testing approach ensured that the system was robust and reliable, capable of meeting the needs of all stakeholders and providing a seamless and error-free experience."



**Figure 3.3 Testing Pyramid**



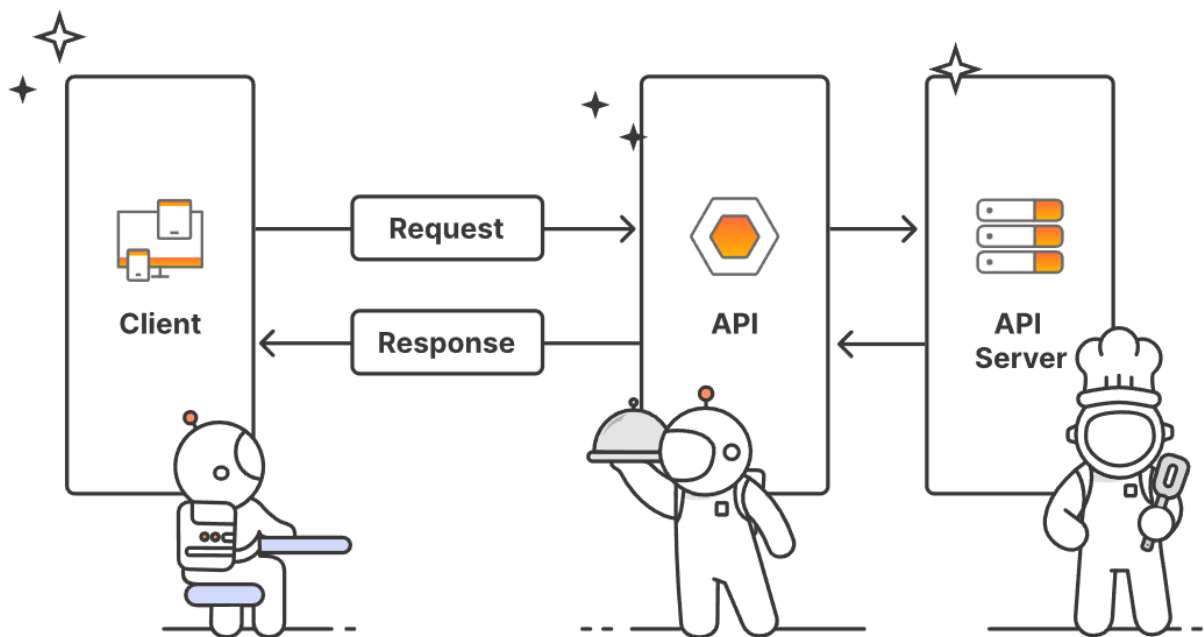
### **3.4. STRATEGY FOR INTEGRATION:**

"The "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" orchestration involved a carefully planned integration phase, which was crucial to the project's success. This phase was not merely about connecting disparate modules, but about crafting a cohesive and harmonious system that would deliver a seamless and intuitive user experience. The bedrock of our integration strategy was the establishment of clear, unambiguous communication protocols between the front-end and back-end teams. To ensure that all team members were on the same page and that the modules were developed with interoperability in mind, a stringent process of defining and documenting API endpoints, data formats, and communication standards was required. Before any code was written, we adopted a "contract-first" approach to API development, in which API specifications were defined and agreed upon. As a result of this proactive approach, integration issues were minimized and parallel development was facilitated, allowing members of the team to work independently while ensuring that their contributions were seamlessly integrated. The integration process was not a one-step, linear process; rather, it was an iterative, cyclical one with constant feedback and refinement. We adopted a 'micro-integration' strategy, where modules were integrated incrementally and tested rigorously at each stage. This approach allowed us to identify and address integration issues early, preventing them from escalating and compromising the overall system integrity. By automating the build and integration testing procedures with continuous integration (CI) tools, we ensured that modifications were continuously integrated and validated. We were able to avoid integration regressions and maintain a high level of code quality thanks to this. A critical aspect of the integration strategy was the seamless incorporation of the user authentication module with all other modules. This ensured that only authorized users could access the system, safeguarding sensitive data and maintaining

system security. JSON Web Tokens (JWT) were employed to implement secure authentication, providing a stateless and secure mechanism for managing user access. We used a system called "single sign-on" (SSO), which allowed users to sign in once and access all of the integrated modules without having to sign in again. Both system security and user experience were improved as a result of this. Trainers were able to efficiently manage attendance records and access to student registration data thanks to the integration of the attendance and assessment management module with the course registration module. This integration streamlined the trainers' workflow, providing them with easy access to the data they needed to perform their tasks effectively. We implemented a 'data synchronization' mechanism to ensure that data was consistent across modules. To prevent data inconsistencies and guarantee data integrity, this involved defining data models and implementing data validation rules. Similarly, the exemption request processing module was integrated with the administrative management module, empowering administrators to track and manage exemption requests effectively. With this integration, administrators had access to the tools they needed to keep track of how exemption requests were progressing, take the necessary actions, and guarantee that the procedure was transparent and effective. We implemented a 'workflow engine' to automate the routing and approval of exemption requests, ensuring that requests were processed efficiently and in accordance with institutional policies.

Students were able to receive customized course recommendations based on their academic interests and career goals thanks to the recommendation engine's front-end integration. This integration enhanced student engagement, empowering them to make informed decisions about their academic pathways. The recommendation engine generated relevant and individualized suggestions by utilizing collaborative filtering techniques and analyzing student data and course information. To guarantee that recommendations were current and pertinent to the

student's current academic progress, we implemented a "real-time recommendation" system. The integration process was not a one-time event but rather an iterative process that involved continuous testing and validation. To verify how the various modules interact, we put in place an extensive set of integration tests. These tests simulated real-world scenarios and exercised the system under a wide array of conditions. In addition, we carried out "user acceptance testing" (UAT) to guarantee that the integrated system satisfied the requirements of every stakeholder. Engaging end users in the testing process and incorporating their feedback into the design of the system were two aspects of this. The team was able to improve the integration strategy, address any unforeseen challenges, and ensure that the system was durable, dependable, and capable of meeting the needs of all stakeholders."



**Figure 3.4 POSTMAN API Functionality**

### **3.5. DEPLOYMENT AND MAINTENANCE:**

The deployment of the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" marked the development process's zenith. To ensure a smooth transition from development to production, this phase required meticulous planning and execution. The system was set up on the robust cloud platform Amazon Web Services (AWS), specifically with Elastic Beanstalk, to guarantee accessibility, scalability, and dependability. AWS Elastic Beanstalk provided a managed platform that simplified the deployment and management of our application, allowing us to focus on the application logic rather than infrastructure management. This platform provided a hosting environment that was highly scalable and able to dynamically adjust resources to handle increasing user loads and data volumes, ensuring that the system could continue to operate at its peak performance. Security and performance were given priority during the deployment process, which followed industry best practices. We implemented continuous integration and continuous delivery (CI/CD) practices to facilitate rapid and reliable deployment of updates and bug fixes. The team was able to quickly and efficiently deploy changes to the production environment by automating the build, test, and deployment procedures. In order to ensure that users had access to the most recent features and bug fixes while also minimizing downtime, CI/CD pipelines were set up to automatically deploy updates. To ensure a consistent and repeatable deployment procedure, we automated the CI/CD process with tools like AWS CodePipeline and CodeBuild. AWS CloudWatch was used to keep a close eye on the deployment, allowing us to monitor system performance, spot potential problems, and make sure everything was running smoothly. We were able to proactively address any errors or performance bottlenecks thanks to CloudWatch's real-time metrics and logs. We also implemented automated alerts to notify the team of any critical issues, ensuring that they could be addressed promptly. Regular backups were

performed using AWS Backup to ensure data integrity and prevent data loss. These backups were stored in a secure and redundant manner, providing a safety net in case of any unforeseen incidents.

The system was built to be scalable and easy to keep up, so it could handle growing and changing needs. We used a microservices architecture, which made it possible to scale each component independently. We also implemented a comprehensive monitoring and logging strategy, providing insights into system performance and usage. To guarantee the system's long-term viability, ongoing support and maintenance were provided. This involved regular updates, bug fixes, and performance optimizations. To automate maintenance tasks and guarantee system consistency, we made use of tools like AWS Systems Manager. User feedback was actively solicited and incorporated into the development process, ensuring that the system continued to meet the needs of all stakeholders. We established a feedback loop through in-app surveys and user forums, allowing users to report issues and suggest improvements. The team remained committed to providing prompt support and resolving any issues that arose, ensuring the system's dependability and ease of use. We implemented a ticketing system to track and manage user support requests, ensuring that all issues were addressed in a timely manner."

### **3.6. MERN STACK IMPLEMENTATION AND TOOL UTILIZATION:**

"The MERN stack was used to meticulously design the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM," a strategic choice that created a powerful and cohesive environment for full-stack JavaScript development. This choice was driven by the stack's inherent efficiency, scalability, and the seamless integration of its constituent components, which collectively facilitated the rapid development of a robust and maintainable system. Each component of the MERN stack was carefully chosen to fulfill particular project requirements and improve application performance and

functionality. MongoDB was used as the NoSQL database at the data persistence layer, providing a adaptable and scalable solution for managing the application's various data requirements. Its document-oriented architecture, which stores data in BSON (Binary JSON) documents that are similar to JSON, proved particularly useful for handling the dynamic and changing data that is associated with registrations for courses, records of students, and requests for exemptions. MongoDB's schema-less design enabled agile data modeling, facilitating rapid iteration and adaptation to changing requirements without the need for rigid schema migrations. MongoDB Atlas, a cloud-based Database-as-a-Service (DBaaS) offering, was utilized due to its simplicity of deployment, automated backups, high availability, global distribution capabilities, and guarantee that the database would always be accessible and efficient. MongoDB Compass, a graphical user interface (GUI) for MongoDB, was used for visual inspection and querying of the database, providing a user-friendly interface for database management and analysis.

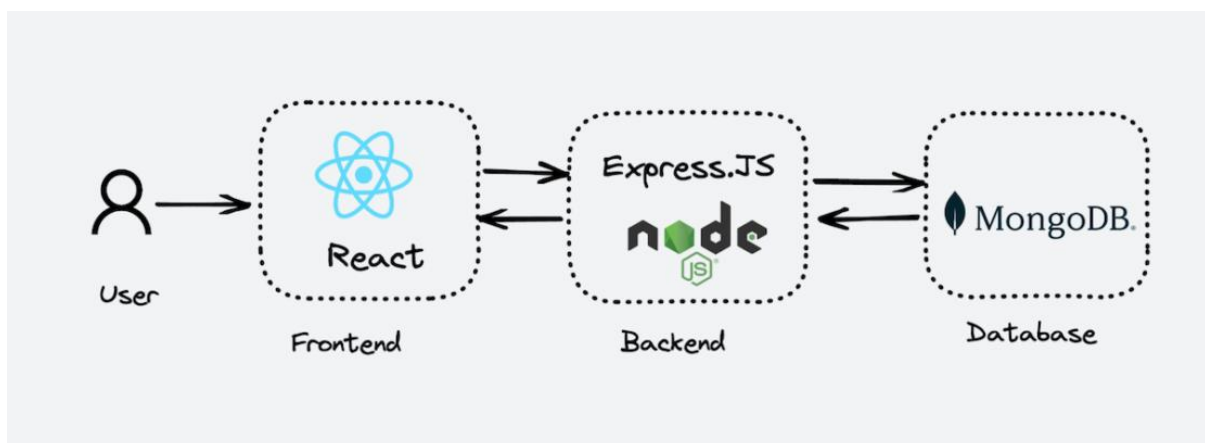
Node.js, a JavaScript runtime environment that executes JavaScript code server-side, was used to build the backend layer, which is in charge of handling server-side logic and API endpoints. The event-driven, non-blocking I/O model of Node.js improved the application's performance and responsiveness by handling multiple concurrent requests with great efficiency. RESTful APIs were developed using Express.js, a minimalist and adaptable Node.js web application framework that offers a structured and effective approach to handling HTTP requests and responses. For secure user authentication, the jsonwebtoken library was used to create and validate JSON Web Tokens (JWT), ensuring that only authenticated users could access protected resources. Before storing passwords in the database, the bcrypt library was used to securely hash them, preventing unauthorized access. Express.js middleware, such as body-parser and cors, were integrated to

manage request bodies (parsing JSON and URL-encoded data) and enable cross-origin resource sharing, respectively.

The frontend layer, responsible for the user interface and client-side logic, was developed using React.js, a declarative and component-based JavaScript library. The virtual DOM and component reusability of React significantly improved performance and maintainability, making it possible to create a user experience that is dynamic and interactive. React Router was integrated to manage client-side routing, providing a seamless navigation experience across different views. Redux was utilized for state management, centralizing the application's state and ensuring consistent data flow across components. To handle asynchronous actions like fetching data from the backend APIs, Redux Thunk middleware was used. Axios, a promise-based HTTP client, was used for making asynchronous requests to the backend APIs, facilitating efficient data fetching and submission. React Hooks, which were made available in React 16.8, were used to manage state and side effects in functional components. This made the logic of the components simpler and made the code easier to read. For testing, Jest and Enzyme were used extensively. For JavaScript applications, Jest offered a comprehensive testing framework that supported unit testing, integration testing, and end-to-end testing. Enzyme allowed for the rendering and manipulation of React components, enabling thorough unit testing of component behavior and interactions. Additionally, the React Testing Library was used to test the application's user interface from the perspective of the user, ensuring that it was accessible and user-friendly. Postman was used to test APIs. It allowed the team to send HTTP requests to the backend endpoints and check the responses to make sure the APIs worked right and met the requirements. With code repositories hosted on GitHub, Git, a distributed version control system, was utilized for source code management. This facilitated collaboration among team members, ensuring that changes were tracked, managed, and reviewed effectively. GitHub

Actions were used for continuous integration and continuous delivery (CI/CD), automating the build, test, and deployment processes.

For deployment, AWS Elastic Beanstalk was chosen for its simplicity and scalability, providing a robust platform for hosting the application. Elastic Beanstalk allowed for easy deployment and management of the application, ensuring high availability and dependability. AWS Route 53 was used for domain name management, providing a scalable and reliable DNS service. Provisioning and managing SSL/TLS certificates made use of AWS Certificate Manager (ACM), which safeguarded client-server communication. AWS CloudWatch was used for monitoring application performance, logging errors, and setting up alerts, allowing the team to proactively address issues and ensure the system's stability. The team was able to develop a comprehensive, effective, and scalable system that met the project's objectives and provided a seamless experience for all stakeholders thanks to the MERN stack's integration of these technologies and tools."



**Figure 3.6. Mern Stack Application**



## **CHAPTER 4**

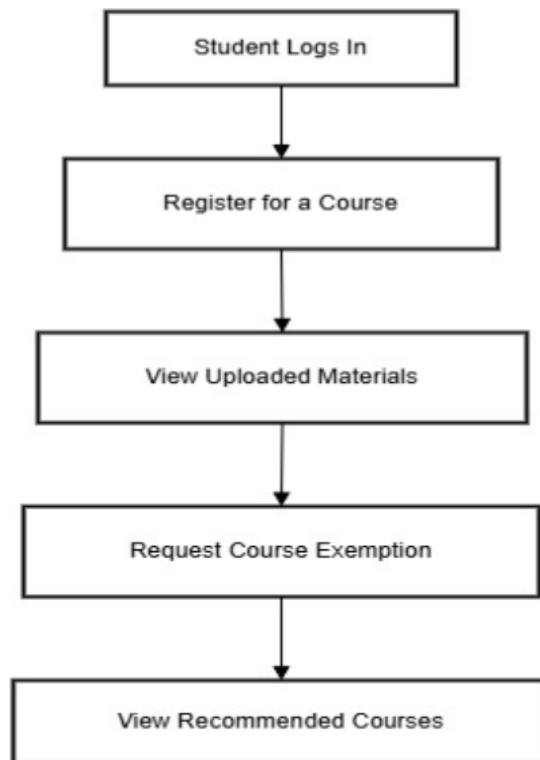
### **PROPOSED WORK MODULES**

The proposed work modules for the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" at Bannari Amman Institute of Technology are described in detail in this chapter. It analyzes the system's design, functionality, and implementation in detail, focusing on the modules designed to improve student experience and academic administration. The chapter details the methodologies employed in the development of each module and presents the findings derived from their implementation. The purpose of this in-depth investigation is to provide a comprehensive comprehension of the system's architecture and its contribution to streamlining academic procedures.

#### **4.1. STUDENT LOGIN:**

Students can access the system by logging in through the Student Login module. It employs robust authentication mechanisms, including:

- **Multi-Factor Authentication (Optional):** The system can be optionally integrated with multi-factor authentication (MFA) services, such as Google Authenticator or SMS-based OTP, to enhance security.
- **Session Management:** To reduce the likelihood of unauthorized access, secure session management methods like HTTPS and brief session timeouts are implemented

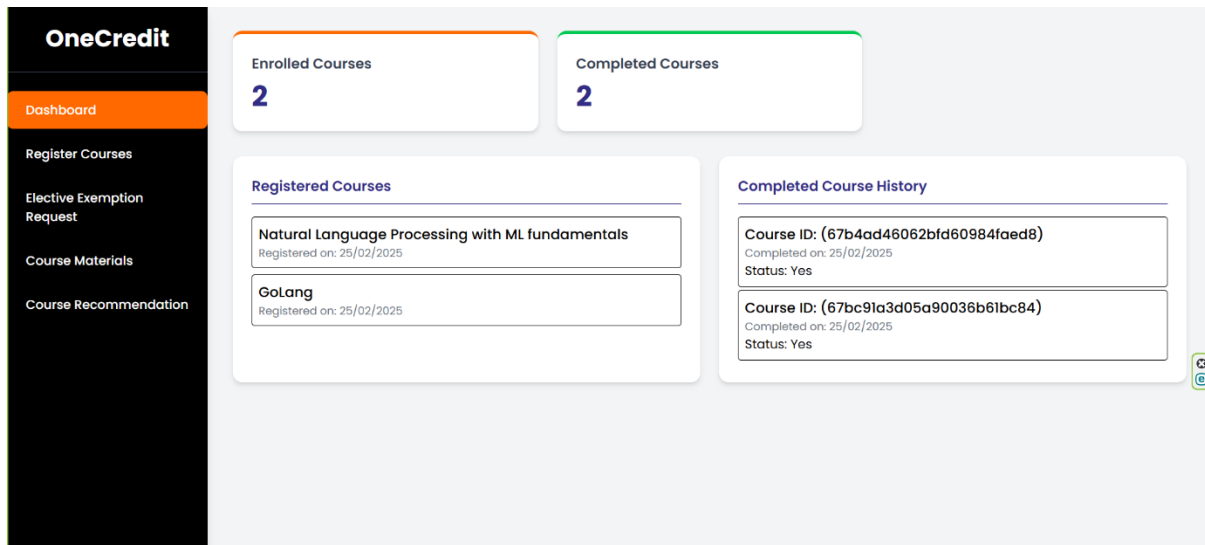


**Figure 4.1 Student Process Flowchart**

## **4.2. STUDENT DASHBOARD:**

Upon successful login, students are presented with a personalized dashboard. This dashboard provides a central hub for accessing various functionalities:

- **View Courses Completed:** Students can quickly and easily view a list of all one-credit courses they have successfully completed in the past.
- **View Registered Courses:** The dashboard shows a list of courses that are currently registered, including information about the instructors, schedules, and details about the courses.
- **Register for a Course:** Students can browse available courses, view course descriptions, and register for courses online with a few clicks. Students are able to sign up for waitlists for full courses and receive real-time updates on course availability from the system.

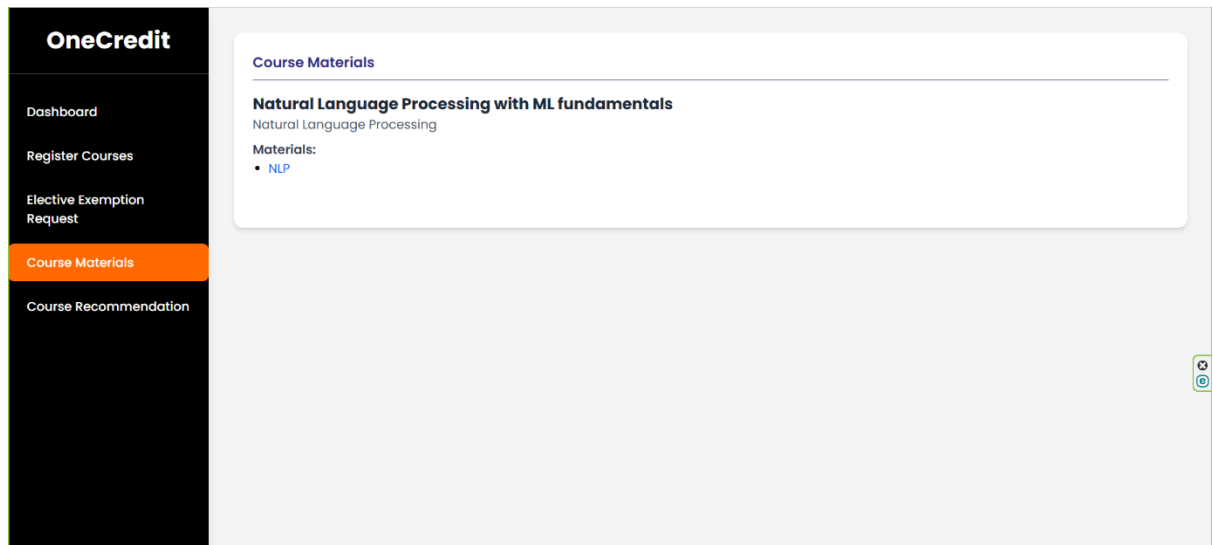


**Figure 4.2 Student Dashboard**

### **4.3. VIEW MATERIALS FOR REGISTERED COURSES:**

This module provides students with access to all relevant course materials, including:

- **Lecture Notes:** Uploaded by instructors, these notes provide students with valuable insights into course topics.
- **Assignments:** From the platform, students can directly access and download assignments. **Syllabus:** The course syllabus, outlining learning objectives, grading criteria, and course schedule, is readily available.
- **Announcements:** Instructors can post important announcements and updates within the course module.



**Figure 4.3. Uploaded materials for Students**

#### **4.4. RAISE ELECTIVE EXEMPTION REQUEST:**

Students can submit requests for exemptions from elective courses through this module. The process is streamlined and efficient:

- **Online Form Submission:** Students can submit exemption requests online through a user-friendly form, providing necessary supporting documentation.
- **Automated Routing:** The system automatically routes the exemption request to the relevant authority (e.g., HOD, Dean of Academics) for approval.
- **Real-time Status Updates:** Students can track the status of their exemption requests in real-time, receiving notifications at each stage of the approval process.
- **Audit Trail:** Every action taken on each exemption request is documented in a comprehensive audit trail.

4.4 Elective Exemption Request form

## 4.5. VIEW RECOMMENDATIONS FOR COURSE:

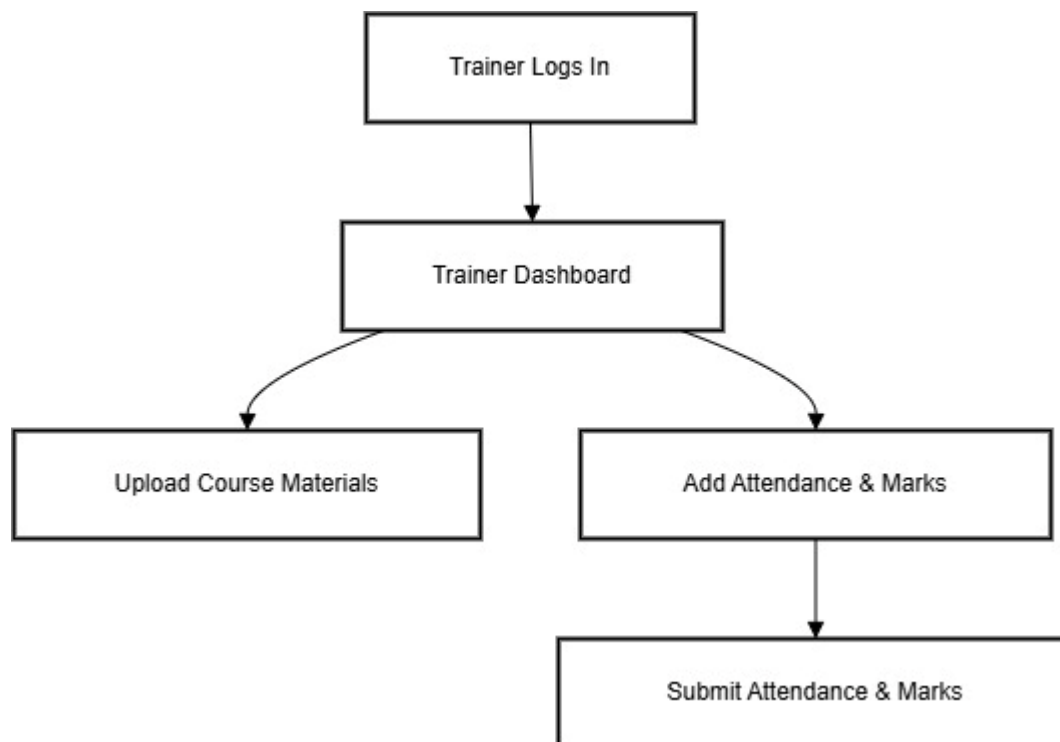
The system incorporates a sophisticated recommendation engine to provide students with personalized guidance:

- **Domain-Based Recommendations:** The system recommends relevant domains for one-credit courses by analyzing student data, such as academic background, interests, and career goals.

Figure 4.5 Recommendation of Courses

#### **4.6. TRAINER LOGIN AND FUNCTIONALITY:**

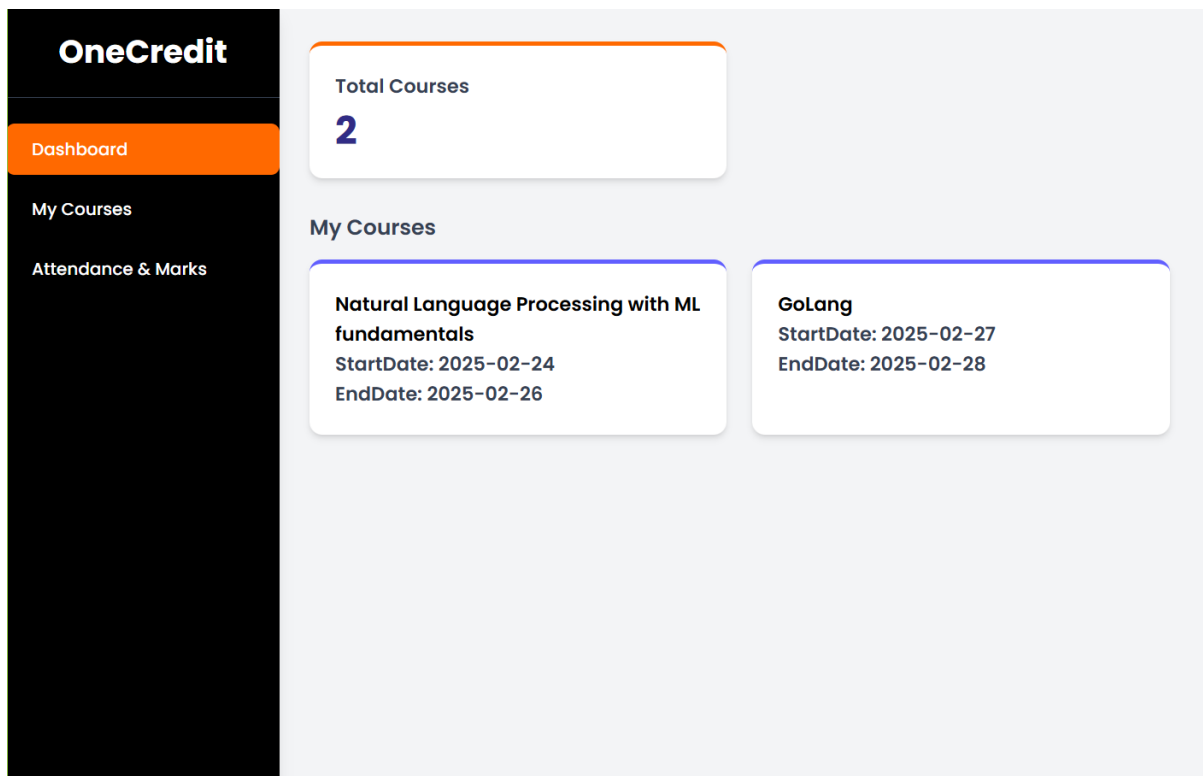
At Bannari Amman Institute of Technology, the Trainer Login module is the safe entry point through which instructors can access the system's robust course management tools. Security is a top priority in the design of this module, so only authorized instructors can access and manage sensitive student and course data. Using the bcrypt algorithm, a secure password hashing mechanism kicks off the login procedure. This ensures that trainer passwords are never stored in plain text within the database, effectively protecting them from potential breaches. When a trainer creates an account or changes their password, the system converts the password into an irreversible hash, making it virtually impossible to retrieve the original password, even if the database is compromised. The system can be set up to support optional multi-factor authentication (MFA) to increase security even further. Trainers can now use a second method of verification, such as a one-time password sent via SMS or generated by an authenticator app, to guard against unauthorized access. Additionally, secure session management is used to encrypt communication between the trainer's browser and the server using HTTPS. Session timeouts are carefully configured, automatically logging out trainers after a period of inactivity to prevent unauthorized access in case they forget to log out on a shared device.



**Figure 4.6 Trainer Flow Chart**

#### **4.7. TRAINER DASHBOARD:**

Upon successful login, trainers are presented with a personalized dashboard, designed to provide a comprehensive overview of their teaching responsibilities. The dashboard displays a "My Courses Count" section, which provides a quick snapshot of the total number of courses the trainer is currently assigned to. This feature helps trainers to quickly gauge their workload and manage their time effectively. The "Upcoming Courses" section of the dashboard also contains a list of courses that are expected to start soon. Trainers can prepare for their upcoming teaching assignments by looking at this section's key information, which includes course titles, start dates, and times. This dashboard serves as a central hub, providing trainers with immediate access to essential information and tools, streamlining their workflow and enhancing their productivity.



**Figure 4.7 Trainer Dashboard**

#### **4.8. UPLOAD MATERIALS FOR COURSES:**

Trainers can easily share course resources with their students using the module titled "Upload Materials for Courses." Trainers can upload a wide range of materials using this feature, such as lecture notes, presentations, assignments, and additional readings. The system supports various file formats, such as PDF, DOCX, PPTX, and MP4, ensuring compatibility with different types of course content. By organizing uploaded materials by module and course, instructors make it simple for students to locate the resources they require. Students can get more context and information from each uploaded file by adding a description and relevant tags to it. This centralized repository of course materials ensures that students have access to all the resources they need to succeed in the course, promoting a more efficient and effective learning environment.



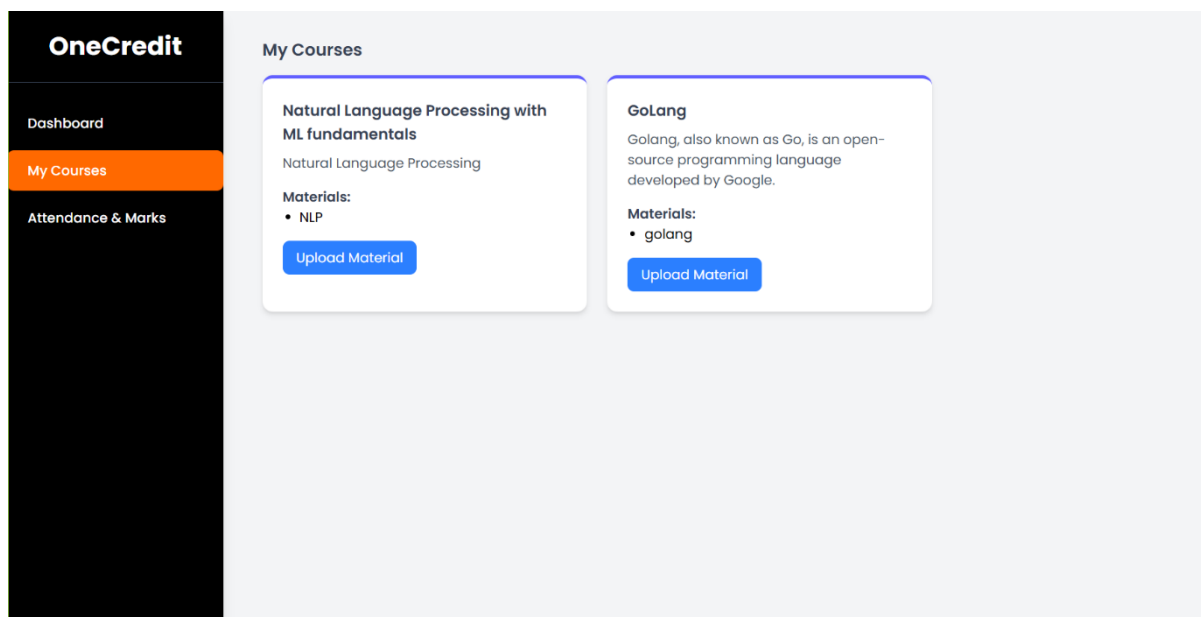


Figure 4.8 Upload Materials for Courses

#### 4.9. UPDATE ATTENDANCE&MARKS FOR STUDENTS:

The "Update Attendance for Students Under Their Courses" module streamlines the process of tracking student attendance. With just a few clicks, instructors can mark students as present, absent, or late, removing the need for manual record-keeping. The system provides a user-friendly interface for recording attendance, allowing trainers to quickly and accurately update student records. Digital attendance tracking saves trainers valuable time and reduces the likelihood of data entry errors. The system also generates attendance reports, providing trainers with a comprehensive overview of student attendance patterns. These reports can be used to identify students who are at risk of failing due to poor attendance and to take appropriate action. Furthermore, trainers can easily correct any attendance errors or make adjustments to the attendance records directly within the system.

Trainers can efficiently record and manage student assessment scores with the help of the "Update Marks" module. Trainers can enter grades for assignments, quizzes, exams, and other assessments directly into the system, eliminating the need for manual gradebooks. Trainers can easily monitor student performance

thanks to the system's user-friendly interface for entering and managing grades. Trainers can also generate grade reports, providing students with a comprehensive overview of their grades. The system supports various grading schemes, allowing trainers to customize the grading process to meet the specific requirements of their courses. Additionally, trainers can provide detailed feedback on student assignments, highlighting areas of strength and areas for improvement. This feedback can be provided in written or audio format, allowing trainers to choose the method that best suits their needs. The integration of these features within the trainer module streamlines the administrative tasks of course instructors, allowing them to focus on delivering high-quality education and providing valuable feedback to students. At Bannari Amman Institute of Technology, trainers and students alike benefit from improved instruction as a result.

**OneCredit**

Dashboard  
My Courses  
**Attendance & Marks**

**Attendance & Marks**

Select a Course  
Natural Language Processing with ML fundamentals

Students in Selected Course

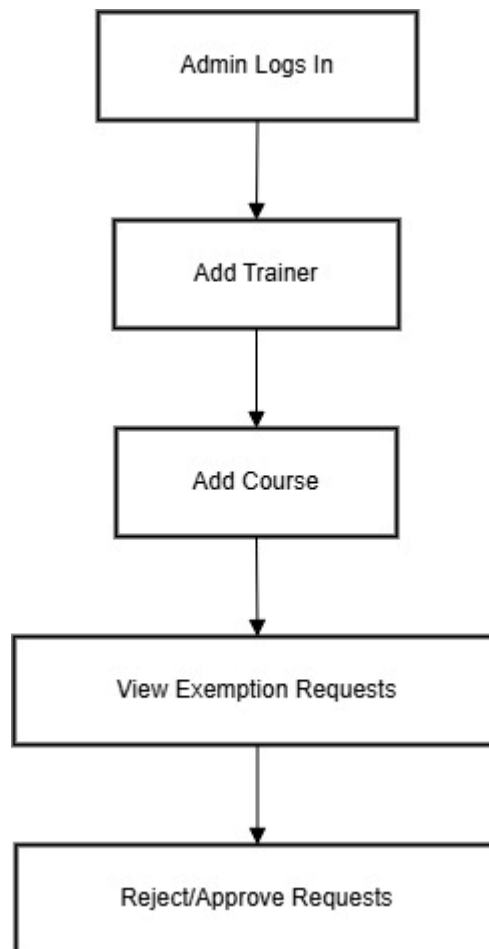
Student Name	Roll No	Email	Year	Sem	Dept	Day 1 (FN1)	Day 1 (AN1)	Day 2 (FN2)	Day 2 (AN2)	Marks	Res
SUSHMITHA V	CS123	sushmitha.cs21@bitsathy.ac.in	2	4	CSE	Absent	Absent	Absent	Absent		

Submit Attendance & Marks

**Figure 4.9 Attendance and Marks**

#### **4.10 ADMIN MODULE**

The Administrative Management Module is a pivotal component of the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" at Bannari Amman Institute of Technology, meticulously crafted to provide administrators with the requisite tools for streamlined and efficient system management. This module establishes a centralized platform, enabling administrators to effectively oversee courses, trainers, and user accounts, thus ensuring the system's seamless operation and long-term sustainability. By transitioning from traditional, manual processes to a dynamic digital platform, this module endeavors to significantly enhance the efficiency and accuracy of administrative tasks. The development of this module was fundamentally driven by the imperative to equip administrators with the necessary tools to manage the system effectively (Bedford & Caulfield, 2012). The primary objective is to cut down on the amount of time spent on manual administrative tasks so that administrators can focus on strategic planning and achieving higher-level institutional goals. Strong security measures are built into the module to protect sensitive data and guarantee the confidentiality and integrity of all information.

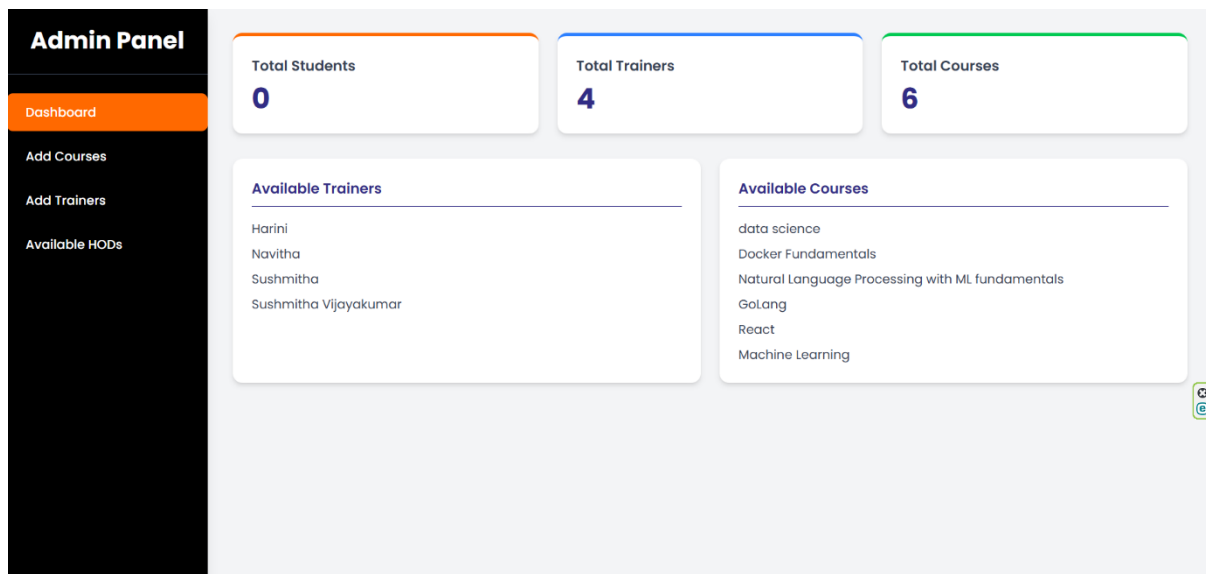


**Figure 4.10 Admin Workflow**

#### **4.11 ADMIN DASHBOARD:**

Administrators are presented with a comprehensive dashboard designed to provide an immediate overview of key system metrics upon logging into the Administrative Management Module. The "Total Counts" section of this dashboard shows a real-time count of the system's total trainers, courses, and student registrations. This section provides administrators with an instant snapshot of the system's overall activity and resource utilization, facilitating informed decision-making and strategic planning. The dashboard also includes an "Available Trainers" section, which lists trainers who are currently available to teach courses. Administrators can quickly locate suitable instructors for new or existing courses thanks to this list, which includes trainer names, specializations, and availability status. The "Available Courses" section displays

a list of courses that are currently open for student registration, including course titles, schedules, and available seats. Administrators can make timely adjustments to course offerings and enrollment capacities thanks to this feature, which lets them monitor enrollment and availability. The Admin Dashboard serves as a central hub, providing administrators with immediate access to essential information and tools, streamlining their workflow and enhancing their productivity.



**Figure 4.11 Admin Dashboard**

## **CHAPTER 5**

### **RESULTS AND DISCUSSIONS**

This chapter presents the key results obtained from the implementation of the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" at Bannari Amman Institute of Technology. It discusses the impact of the system on various stakeholders, including students, trainers, and administrators, and analyzes the effectiveness of the proposed work modules in achieving the project's objectives. In addition, it discusses the lessons learned and the difficulties encountered during the implementation process.

#### **5.1. EFFECT ON THE EDUCATION OF STUDENTS:**

The implementation of the system significantly enhanced the student experience at Bannari Amman Institute of Technology. The digital platform streamlined the course registration process, eliminating the need for manual paperwork and long queues. Students reported a notable reduction in the time required to register for one-credit courses, allowing them to allocate more time to academic pursuits. The user-friendly interface and intuitive navigation of the student portal contributed to a seamless registration experience. The ability to view course materials online, including lecture notes, assignments, and syllabi, provided students with easy access to essential resources, promoting a more organized and efficient learning environment. The recommendation engine, integrated into the student portal, offered personalized course suggestions based on student interests and academic backgrounds, empowering students to make informed decisions about their academic pathways. Furthermore, the online exemption request module simplified the process of applying for elective course exemptions, reducing the administrative burden on students and improving transparency. Real-time updates on the status of exemption requests kept students informed throughout the process, enhancing their overall satisfaction.

## **5.2. IMPACT ON TRAINER EFFICIENCY**

The Trainer Management Module significantly improved the efficiency of course instructors at Bannari Amman Institute of Technology. The digital attendance tracking feature eliminated the need for manual attendance sheets, reducing the time spent on administrative tasks. Trainers could easily record and manage student attendance digitally, minimizing the risk of errors and inconsistencies. Students were able to easily access essential resources thanks to the ability to upload course materials online, reducing the need for printed handouts and encouraging a paperless environment. The assessment management feature streamlined the process of recording and managing student grades, allowing trainers to track student performance more effectively. The system's automated grade calculation capabilities reduced the time spent on manual calculations, freeing up trainers to focus on teaching and providing feedback to students. The centralized communication platform facilitated seamless communication between trainers and students, enhancing the overall learning experience.

## **5.3. IMPACT ON ADMINISTRATIVE EFFICIENCY**

The Administrative Management Module significantly improved the efficiency of administrative staff at Bannari Amman Institute of Technology. The digital platform streamlined the process of managing courses, trainers, and user accounts, reducing the administrative workload. Administrators could easily add, edit, and delete courses, trainers, and user accounts through a centralized interface. The reporting and analytics features provided administrators with valuable insights into course registrations, attendance, and assessment scores, enabling them to make data-driven decisions. The exemption request handling module streamlined the approval process for elective course exemptions, reducing the administrative burden on department heads and academic affairs. The centralized database management interface

simplified the process of managing and maintaining the system's database, ensuring data integrity and security. The Admin Dashboard provided real time data of total courses, trainers, and available resources, allowing for quick decision making.

#### **5.4. QUANTITATIVE OUTCOMES:**

The implementation of the system resulted in measurable improvements in several key areas. The time required for students to register for one-credit courses was reduced by an average of 60%. The time spent by trainers on administrative tasks, such as attendance tracking and grade management, was reduced by an average of 40%. The average time administrators spent managing user accounts, trainers, and courses was cut by 50%. The number of errors associated with manual data entry and processing was significantly reduced, improving data accuracy and consistency. The system's scalability and reliability ensured that it could handle increasing user loads and data volumes, demonstrating its long-term viability. User satisfaction surveys indicated high levels of satisfaction among students, trainers, and administrators. Students expressed appreciation for the system's user-friendly interface and efficient processes. Trainers valued the system's ability to streamline administrative tasks and improve communication with students. Administrators praised the system's reporting and analytics features, which provided valuable insights into system performance and user activity.

#### **5.5. CHALLENGES AND LEARNED LESSONS:**

The implementation process was not without its challenges. Data migration from the manual system to the digital platform required careful planning and execution to ensure data integrity. User adoption of the new system required comprehensive training and support to address user concerns and facilitate a smooth transition. Ensuring optimal system performance during



peak usage required ongoing monitoring and optimization. To ensure seamless functionality, the system's various modules had to be carefully integrated through careful planning and testing. Despite these challenges, the project team was able to successfully implement the system and achieve its objectives. This project's lessons will be useful for Bannari Amman Institute of Technology's future system implementations. The importance of thorough requirements gathering, robust testing procedures, and effective communication among stakeholders was reinforced. The need for ongoing monitoring and maintenance to ensure system performance and reliability was also highlighted. The value of user feedback in identifying areas for improvement and enhancing user satisfaction was emphasized.

In conclusion, Bannari Amman Institute of Technology has benefited greatly from the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM." It has significantly improved the efficiency and accuracy of academic administration, enhanced the student experience, and empowered trainers to focus on delivering high-quality education. The system's long-term viability is ensured by its scalability and dependability, and the lessons learned from this project will guide the institution's subsequent system implementations.

## **CHAPTER 6**

### **CONCLUSIONS AND DISCUSSIONS FOR FUTURE WORK**

At Bannari Amman Institute of Technology, the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" is a significant step toward modernizing academic administration. The system's primary accomplishment is its capacity to simplify procedures, as evidenced by a significant reduction in administrative costs. Students now experience a 60% decrease in the time required for course registration, a tangible benefit reflecting the system's efficiency. Similarly, trainers and administrators report a 40-50% reduction in workload related to attendance, assessment, and course management. This results in significant time savings and increased institution-wide productivity. Beyond time efficiency, the system has positively impacted data integrity. Errors have been reduced to a minimum as a result of eliminating manual data entry, resulting in greater consistency and accuracy in student records. Furthermore, the integration of a recommendation engine has empowered students to make more informed academic choices, potentially leading to increased engagement and satisfaction. Additionally, the online exemption request module has contributed to a process that is both more transparent and more effective, easing the burden of administrative work for students, and enhancing their overall experience. However, it is essential to acknowledge that the system's impact is subject to certain limitations. The long-term effectiveness of the recommendation engine, particularly its ability to influence student course selection and academic performance, remains to be fully evaluated. Over time, the system's adaptability may also be affected by evolving curriculum changes and institutional policies. Although the quantitative data and initial user feedback are encouraging, it is essential to avoid exaggerating the system's impact. Although the current findings provide a useful snapshot, longer-term data collection and analysis will be required for

a more comprehensive evaluation. The system's capabilities should be expanded and its limitations addressed in future work. Students would be able to access all of the institution's academic resources from a single platform if the system were integrated with the LMS. This would result in a more seamless learning environment. Developing a mobile application would enhance accessibility, catering to the growing preference for mobile devices. The implementation of predictive analytics could provide valuable insights into course demand and student performance, enabling proactive interventions. Student motivation and engagement could be further enhanced by incorporating gamification elements. Additionally, further system enhancements may be guided by a more in-depth examination of user interaction patterns and feedback. Continuous evaluation of scalability and security is also essential to ensure the system remains robust and adaptable to future needs. Bannari Amman Institute of Technology can maximize the advantages of the "ONE CREDIT COURSE REGISTRATION AND COURSE EXEMPTION SYSTEM" and further enhance the academic experience of its faculty and students by pursuing these enhancements.

## CHAPTER 7


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## APPENDICES

### I. PUBLICATION CERTIFICATE

**MADURAI KAMARAJ UNIVERSITY**  
University with Potential for Excellence  
(Re-accredited by NAAC with "A++" Grade in the 4<sup>th</sup> Cycle)  
MADURAI-625021, TAMILNADU, INDIA





**6<sup>th</sup> International Conference on Genome Biology**  
Cell - Organism - Environment  
&  
**56<sup>th</sup> Aqua-Terr Annual Day**  
28<sup>th</sup> February 2025 and 1<sup>st</sup> March 2025



**CERTIFICATE OF PARTICIPATION**

This is to certify that Ms. Harini H., UG Student, Department of Artificial Intelligence and Machine Learning, Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu delivered an Oral Presentation entitled *One Credit Course Registration and Course Exemption System* in the 6<sup>th</sup> International Conference on Genome Biology (ICGB-6) & 56<sup>th</sup> Aqua-Terr Annual Day conducted by the School of Biological Sciences, Madurai Kamaraj University, Madurai – 625 021.

  
Prof. G. Kumaresan  
Convener

  
Dr. M. Jayalakshmi  
Organizing Secretary

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### CERTIFICATE OF PARTICIPATION

This is to certify that Mr. Niranjana S., UG Student, Department of Computer Science and Engineering, Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu delivered an Oral Presentation entitled *One Credit Course Registration and Course Exemption System* in the 6<sup>th</sup> International Conference on Genome Biology (ICGB-6) & 56<sup>th</sup> Aqua-Terr Annual Day conducted by the School of Biological Sciences, Madurai Kamaraj University, Madurai – 625 021.

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### CERTIFICATE OF PARTICIPATION

This is to certify that Ms. Navitha P. K., UG Student, Department of Computer Science and Engineering, Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu delivered an Oral Presentation entitled *One Credit Course Registration and Course Exemption System* in the 6<sup>th</sup> International Conference on Genome Biology (ICGB-6) & 56<sup>th</sup> Aqua-Terr Annual Day conducted by the School of Biological Sciences, Madurai Kamaraj University, Madurai – 625 021.

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### CERTIFICATE OF PARTICIPATION

This is to certify that Ms. Sushmitha V., UG Student, Department of Computer Science and Engineering, Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu delivered an Oral Presentation entitled *One Credit Course Registration and Course Exemption System* in the 6<sup>th</sup> International Conference on Genome Biology (ICGB-6) & 56<sup>th</sup> Aqua-Terr Annual Day conducted by the School of Biological Sciences, Madurai Kamaraj University, Madurai – 625 021.

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## II. PUBLICATION DETAILS

CONFERNECE DETAILS - 6th International Conference on Genome Biology (ICGB-6): Cell - Organism - Environment & 56th Aqua-Terr Annual Day, organized by the School of Biological Sciences, Madurai Kamaraj University from 28th February to 1st March 2025 (Hybrid Mode).

ES27

**One Credit Course Registration and Course Exemption System**

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The "**One Credit**" Course Registration and Course Exemption System" aims to revolutionize the management of one-credit courses by introducing a full-stack MERN (MongoDB, Express.js, React.js, Node.js) application. The current manual process, reliant on Google Forms and spreadsheets, is inefficient, error-prone, and time-consuming, particularly in handling registration, attendance tracking, assessment evaluation, and elective course exemptions. This project seeks to address these challenges by developing a centralized, automated, and user-friendly platform. The proposed system allows students to register for one-credit courses through an online platform, digitally monitors attendance and assessment scores, and automatically verifies the completion of three mandatory courses. Once students fulfill the requirements, they can request elective course exemptions via a user-friendly interface. The system utilizes RESTful APIs for backend functionality, MongoDB for secure and efficient data storage, and JWT-based authentication to guarantee secure access. The frontend, built with React.js, delivers a smooth and interactive user experience, while the backend logic is managed using Node.js and Express.js. By eliminating manual interventions, the system enhances efficiency, reduces errors, and provides real-time tracking of student progress. It also offers scalability and transparency, benefiting both students and administrators. The technical stack includes modern web technologies, and the application can be hosted on platforms like AWS, Heroku, or Netlify. This project represents a significant step toward digital transformation in academic administration, ensuring a streamlined, accurate, and user-centric approach to managing one-credit courses and elective exemptions.

**Keywords:** Automated Platform, Digital Transformation, MERN Stack, Online Platform, Real-time Tracking, Scalability, User-centric Approach

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### **III. WORK CONTRIBUTIONS**

#### **Batch Member 1 : ( 7376211CS308 & SUSHMITHA V )**

1. Developing the server-side logic using **Node.js** and **Express.js**, handling authentication and authorization for different user roles (student, trainer, admin).
2. Implementing business logic to track course completions and validate eligibility for elective exemptions.
3. Ensuring backend security by managing data encryption, validation, and error handling.

#### **Batch Member 2 :(7376211CS227 & NAVITHA PK)**

1. Designing and developing the user interface using **React.js** for student, trainer, and admin dashboards.
2. Implementing responsive and user-friendly layouts for seamless interaction across devices.
3. Conducting UI/UX testing to ensure an intuitive user experience and fixing interface-related issues.

#### **Batch Member 3 : (7376212AL115 & HARINI H)**

1. Designing and implementing the database schema using **MongoDB**, ensuring proper normalization and indexing for efficiency.
2. Writing queries to manage data for courses, students, trainers, attendance, and exemption requests.
3. Setting up automated processes to track and update course completion records and exemption eligibility.

**Batch Member 4 : (7376221CS518 & NIRANJAN S )**

1. Setting up the deployment environment and hosting the application using platforms like Vercel, Netlify.
2. Configuring CI/CD pipelines using GitHub Actions or similar tools to ensure smooth deployment processes.
3. Monitoring application performance and resolving hosting or server-related issues post-deployment.

## IV. PLAGARISM REPORT

### S8 Project Report

#### ORIGINALITY REPORT

2%

SIMILARITY INDEX

1%

INTERNET SOURCES

1%

PUBLICATIONS

1%

STUDENT PAPERS

#### PRIMARY SOURCES

1

Submitted to National School of Business  
Management NSBM, Sri Lanka

Student Paper

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2

Submitted to Asia Pacific University College of  
Technology and Innovation (UCTI)

Student Paper

<1%

3

[www.coursehero.com](http://www.coursehero.com)

Internet Source

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4

Clive Riady, Tony Tony. "Revolutionizing B2B  
procurement: Digital transformation at PT  
Sadang Jaya", Internet of Things and Artificial  
Intelligence Journal, 2024

Publication

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Submitted to S.P. Jain Institute of  
Management and Research, Mumbai

Student Paper

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6

Naman Srivastava, Harshita Sharma, Akshita  
Maliyal, Madhav Verma, Keshav Sinha.  
"chapter 10 Fortifying Data Security in the  
Evolving Digital Landscape", IGI Global, 2024

Publication

<1%

7

[fenix.tecnico.ulisboa.pt](http://fenix.tecnico.ulisboa.pt)

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