

CodeX

Ed-Tech Web App

**A PROJECT REPORT
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MASTER OF COMPUTER APPLICATION

**Under the Supervision of
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DEPARTMENT OF COMPUTER APPLICATIONS
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DECLARATION

I hereby affirm that the work presented in the report titled "CodeX: Programming Learning Web App" was conducted solely by me. I have not previously submitted the content of this report for the fulfillment of any other academic degree or diploma from any other institution. Proper acknowledgment has been provided for all external sources, including words, ideas, diagrams, graphics, and computer programs that are not my original work. Quotation marks have been used to attribute verbatim sentences to their original authors or sources. I confirm that no part of this work is plagiarized, and the experiments and results reported herein are genuine. In the event of any allegations of plagiarism or manipulation of experiments and results, I acknowledge full responsibility and accountability.

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CERTIFICATE

Certified that **Ashutosh Modanwal (2200290140043)** has carried out the research work presented in this thesis entitled “**CodeX Educational Web App**” for the award of Master of Computer Application from Dr. A.P.J. Abdul Kalam Technical University, Lucknow under my/our (print only that is applicable) supervision. The thesis embodies results of original work, and studies are carried out by the student himself/herself (print only that is applicable) and the contents of the thesis do not form the basis for the award of any other degree to the candidate or to anybody else from this or any other University/Institution.

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ABSTRACT

Programming learning is the process of acquiring knowledge and skills in computer programming through online platforms or web applications. It encompasses various technologies, including interactive coding tutorials, virtual classrooms, automated assessments, and collaborative coding environments. Programming learning platforms leverage features such as real-time coding editors, personalized learning paths, challenges, and community forums to facilitate effective learning experiences.

Many programming learners struggle due to limited access to educational resources or attendance at coding workshops. This lack of accessibility hampers their progress and career prospects. However, platforms like CodeX offer a solution by providing online learning opportunities, enabling learners to overcome geographical barriers and access high-quality coding education remotely. This democratization of programming instruction empowers individuals from diverse backgrounds to acquire essential coding skills and pursue fulfilling careers in technology.

Programming education entails learning computer coding skills through various online platforms. These include interactive coding tutorials, virtual classrooms, automated assessments, and collaborative coding environments. Such platforms offer features like real-time coding editors, personalized learning paths, challenges, and community forums to enhance the learning experience.

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Chapter 1

Introduction

1.1 Overview

The "Online Learning Platform" has been meticulously crafted to address the myriad challenges present in traditional educational settings. Its primary goal is to revolutionize the way education is delivered and managed. By harnessing the power of technology, this platform endeavors to streamline administrative tasks, minimize errors, and enhance overall user experience. This platform is finely tuned to cater to the specific needs of educational institutions, offering a bespoke solution that aligns seamlessly with their operational requirements. One of its core principles is to reduce the burden of manual data entry, thereby minimizing the risk of inaccuracies. Moreover, it boasts intelligent error detection mechanisms that promptly alert users to any discrepancies in data entry, ensuring data integrity at all times. A key hallmark of this platform is its unparalleled user-friendliness. It has been meticulously designed to be intuitive and straightforward, requiring minimal training for users to navigate effectively. This user-centric approach ensures that educators, administrators, and students alike can effortlessly harness the platform's capabilities to their fullest extent. In essence, the "Online Learning Platform" represents a paradigm shift in educational management, offering a robust and versatile solution that empowers institutions to thrive in today's dynamic educational landscape. By leveraging technology to its fullest potential, it paves the way for a more efficient, effective, and engaging learning experience for all stakeholders involved.

1.2 Problem Statement

In the rapidly evolving landscape of online commerce, there is a growing demand for robust and scalable e-commerce platforms. Traditional methods of shopping are being replaced by digital experiences, creating a need for feature-rich and user-friendly online stores. Existing e-commerce solutions often come with limitations, making it challenging for businesses to tailor their platforms to specific needs and requirements.

1.3 Objectives

The primary goal of the Project on Online Learning Management System is to oversee the management of Course, Course Category, Enrollment, Student, and Grade. It centrally manages information related to Courses, Student Enrollment, and Academic Records. This project is exclusively developed for administrative use, ensuring access solely to authorized administrators. Its objective is to develop a software application that automates the manual processes involved in managing Courses, Course Categories, Student Enrollment, and Grades. It comprehensively tracks information pertaining to Course Enrollment, Student Details, and Academic Performance.

1.4 Scope

This scope aims to streamline comprehensive management processes efficiently. Rapid data collection ensures clarity, simplicity, and coherence. It facilitates thorough understanding of past-year management and aids current operations of the Online Learning Management System. Moreover, it optimizes cost and ensures seamless procedural flow. The project focuses on automating business processes, specifically computerizing various aspects of the Online Learning Management System.

- In the CodeX platform, users can fill out various forms digitally, and multiple copies of the forms can be easily generated simultaneously.
- The platform allows for the direct printing of manifests, eliminating the need to create them separately and saving time.
- CodeX assists users in tracking their efforts spent on different learning areas.
- To utilize resources in an efficient manner by increasing their productivity through automation.
- The system generates types of information that can be used for various purposes.
- It satisfy the user requirement
- Be easy to understand by the user and operator
- Be easy to operate
- Have a good user interface
- Be expandable

- Delivered on schedule within the budget.

1.5 Feature

- CodeX supports product and component-based issue management with easy creation and modification of issues.
- Users can query the issue list to any depth for comprehensive issue tracking
- Reporting & Charting in more comprehensive way
- User accounts are provided to control access and maintain security
- Simple Status & Resolutions
- Multi-level Priorities & Severities.
- Targets & Milestones for guiding the programmers
- Attachments & Additional Comments for more information
- Robust database back-end
- Various level of reports available with a lot of filter criteria's
- It contains better storage capacity.
- Accuracy in work.
- Easy & fast retrieval of information.
- Well-designed reports.
- Decrease the load of the person involve in existing manual system.
- Access of any information individually.
- Work becomes very speedy.
- Easy to update information

1.6 Hardware / Software Requirement

Hardware Requirement

Table no 1.6

S. N.	Description
1	PC with 5 GB or more Hard disk.
2	PC with 2 GB RAM.
3	PC with core i3 or above processor.

Software Requirements

Table no 1.7

S. N.	Description	Type
1	Operating System	Windows 10 or 11 or Ubuntu 18.04 or above
2	Language	Python 3
3	Front End	React 17
4	IDE	Google Colab, VS Code
5	Browser	Chrome, Firefox, Edge

1.7 Background

In the realm of programming education, online learning is gaining popularity as students increasingly opt for its numerous advantages. From the learner's perspective, this approach offers transparent pricing and a diverse array of courses, making it more convenient than traditional classroom-based learning. By eliminating the need to commute to physical classrooms and endure challenges like parking and crowded spaces, online learning provides a smoother educational experience. Therefore, understanding, analyzing, and adapting to student behavior is essential for the success of any online learning platform.

In the domain of programming education, the central objective remains addressing and fulfilling learners' needs. The prominence of online learning is increasing, utilizing the internet to promote programming courses and platforms. As individuals become more acquainted with online learning, they are more inclined to engage with programming education resources.

The dynamic competition between online and offline mediums in the realm of programming education signals a new era where learners can select the platform that best suits their needs. Whether through online or offline channels, the goal remains to attract learners and provide them with a fulfilling experience, encouraging their return.

Educational providers face increasingly diverse and sophisticated learner demands in the digital age. To adapt to these changes and achieve optimal profitability, educational platforms strive to offer high-quality courses and services. As the digital landscape expands and online learning becomes more prevalent in daily life, educational providers must embrace online platforms to cater to the needs of modern learners.

The CodeX project emerges in response to the shifting landscape of programming education, where online learning platforms are becoming increasingly prevalent and indispensable. In this dynamic environment, the project aims to carve out its niche by offering a comprehensive and accessible platform for individuals seeking to enhance their coding skills and knowledge.

At its core, CodeX is designed to address the evolving needs and preferences of modern learners, who are drawn to the flexibility and convenience offered by online learning. By leveraging the power of the internet, the platform provides learners with a wealth of programming courses and resources that can be accessed anytime, anywhere. Whether students are looking to delve into a new programming language, refine their coding techniques, or prepare for career advancement, CodeX aims to be their go-to destination

One of the key strengths of CodeX lies in its diverse and curated course offerings, which cater to learners of all levels and backgrounds. From introductory courses for beginners to advanced topics for seasoned developers, the platform strives to accommodate the diverse learning objectives and skill levels of its users. Moreover, CodeX places a strong emphasis on quality and relevance, ensuring that its courses are up-to-date, engaging, and aligned with industry standards and trends.

CHAPTER 2

FEASIBILITY STUDY

After the development phase of the programming learning platform, it's imperative to conduct a thorough feasibility study to assess the viability and potential success of the project. While every project may seem feasible in an ideal scenario with unlimited resources and time, the real-world feasibility study delves into practical considerations and constraints. Technical feasibility assesses the platform's compatibility with existing technologies and infrastructure. It examines whether the proposed solution can be implemented using the chosen technologies, such as the MERN stack, and if it can seamlessly integrate with other systems or APIs. Ultimately, the feasibility study aims to provide stakeholders with valuable insights into the project's viability and potential risks. It guides decision-making processes, helping to ensure that resources are allocated efficiently and that the project is set up for success.

2.1 Economical Feasibility

Economic feasibility is a crucial aspect in evaluating the viability of the programming learning platform project, assessing the financial investment required against the expected returns. The project's economic feasibility hinges on factors such as development costs, operational expenses, and potential revenue streams. Initial investments in platform development, security measures, and promotional activities are balanced against the projected user subscriptions and profitability. Moreover, ongoing expenses like platform maintenance, server hosting, and software licensing fees are factored into the economic analysis. The project's viability is bolstered by its scalability potential, cost-effectiveness of technology solutions, and the ability to capitalize on emerging trends in programming education. A positive economic feasibility assessment ensures that the platform has the capability to generate sustainable revenue and deliver a satisfactory return on investment, making it a financially prudent initiative.

Economic feasibility in the context of an online education learning project encompasses various financial considerations that are crucial for determining its viability and potential success. Here's a more detailed explanation of the aspects involved:

Development Costs: This encompasses the expenditures associated with developing the CodeX platform, such as hiring developers, acquiring necessary software licenses, designing the user interface, and integrating essential features like code repositories, project management tools, and collaboration functionalities.

2.2 Operational Feasibility

Operational Expenses: These are the ongoing costs required to ensure the smooth operation of the CodeX platform. They may include expenses related to platform maintenance, user support services, server hosting, database management, version control, and any other operational overheads necessary for efficient project management.

Revenue Streams: This refers to the various sources of income that the CodeX project can potentially generate. Common revenue streams for project management platforms like CodeX include subscription fees for premium features, licensing fees for enterprise usage, consulting services, training programs, and partnerships with educational institutions or coding bootcamps.

Projected Sales and Profitability: Based on thorough market analysis, competitor evaluations, and business forecasts, the anticipated adoption rate and revenue potential of the online learning platform are projected. This involves predicting user demand, formulating pricing strategies, and identifying target audience segments to estimate potential revenue streams.

Maintenance Costs: In addition to initial development costs, ongoing expenditures are necessary to maintain and update the online learning platform for optimal performance, security, and user satisfaction. This may include software upgrades, security enhancements, bug resolutions, and other routine maintenance activities.

Hosting Fees: Hosting the online learning platform on servers incurs significant expenses. Factors such as server capacity, bandwidth utilization, data storage, and uptime reliability influence the determination of hosting fees.

Payment Gateway Expenses: Processing payments securely and efficiently is essential for any online programming learning web app. Payment gateway providers typically charge

transaction fees or a percentage of each sale, which adds to the operational costs of the online educational project.

Scalability: The ability of the online educational platform to accommodate growth and handle increased traffic, transactions, and data volume without significant disruptions or performance issues is crucial for long-term success. Scalability often influences both development and operational costs.

Cost-Effectiveness of Technology Solutions: Evaluating the efficiency and cost-effectiveness of technology solutions, such as online educational platforms, content management systems, analytics tools, and marketing automation software, helps optimize resource allocation and maximize ROI.

2.3 Technical Feasibility

Technical feasibility is a critical component in assessing the viability of an online educational project, focusing on the technological infrastructure required for its successful implementation. The project's technical feasibility involves evaluating the compatibility and capability of existing or proposed technology to meet the project's objectives. This encompasses considerations such as website development, hosting, database management, and integration with other systems. The platform must ensure security for online transactions, data protection, and user privacy. Scalability and adaptability to future technological advancements are crucial,

Ensuring the online learning platform can adapt to emerging trends is crucial. Technical feasibility also involves evaluating the availability of skilled resources, expertise, and the feasibility of incorporating necessary features like mobile responsiveness and application programming interfaces (APIs). A favorable technical feasibility study affirms that the selected technology stack meets project needs, guaranteeing a resilient and enduring online learning platform.

Technical feasibility pertains to scrutinizing the technological facets essential for the effective implementation of an online educational project. Here's an elaborate breakdown of its constituents:

Compatibility and Capability of Technology: This involves assessing whether the existing or proposed technological infrastructure is suitable for meeting the objectives of the e-commerce project. It includes evaluating hardware, software, and networking components to ensure they work together seamlessly to support the desired functionality.

Website Development: Technical feasibility evaluates the feasibility of developing the e-commerce website or platform, considering factors such as the chosen programming languages, frameworks, content management systems (CMS), and development methodologies. It also includes considerations for responsive design, ensuring the website functions effectively across various devices and screen sizes.

Hosting: Assessing the technical feasibility of hosting involves determining the appropriate hosting environment, whether it be shared hosting, dedicated servers, cloud Hosting, or a hybrid solution. Factors such as scalability, reliability, security, and performance are considered in selecting the hosting provider and configuration.

Database Management: Managing databases efficiently is crucial for storing and retrieving product information, customer data, transaction records, and other essential information. Technical feasibility examines database technologies, schema design, data normalization, indexing strategies, and backup and recovery procedures to ensure optimal performance, reliability, and data integrity.

Integration with Other Systems: Online educational platforms often need to integrate with third-party systems and services, such as payment gateways, shipping carriers, inventory management systems, and customer relationship management (CRM) software. Technical feasibility assesses the feasibility of integrating these systems seamlessly while maintaining data consistency, security, and reliability.

Security: Ensuring the security of online transactions, sensitive customer information, and the overall online educational platform is paramount. Technical feasibility evaluates security measures such as encryption, secure sockets layer (SSL) certificates, firewalls, intrusion detection systems (IDS), and compliance with industry standards like PCI-DSS (Payment

Card Industry Data Security Standard).

Scalability and Adaptability: Technical feasibility considers the scalability of the e-commerce platform to accommodate growth in user traffic, product inventory, and transaction volume. It also assesses the adaptability of the technology stack to incorporate future advancements and emerging trends in online educational platform, such as artificial intelligence (AI), machine learning (ML), voice commerce, and augmented reality (AR).

Availability of Skilled Resources and Expertise: Assessing technical feasibility involves evaluating the availability of skilled developers, engineers, designers, and other technical professionals with the expertise required to implement and maintain the online educational platform effectively.

Mobile Responsiveness and APIs: Technical feasibility examines the feasibility of implementing features such as mobile responsiveness for optimal user experience on Smartphones and tablets. It also assesses the availability and usability of application programming interfaces (APIs) for integrating with external services and enabling customizations and third-party integrations.

2.4 Behavioural Feasibility

Behavioural feasibility assesses the readiness of users, both learners and instructors, to adopt and utilize the proposed online learning platform. In the context of an educational platform, comprehending user behaviour is crucial for its effectiveness. It involves examining student preferences, learning habits, and their comfort with digital learning tools. Student acceptance of features like interactive content, self-paced learning modules, and intuitive interfaces is evaluated. Additionally, educator engagement and adaptability to new teaching methodologies, such as online assessments and virtual classrooms, are assessed. A positive behavioural feasibility analysis indicates that the target audience is likely to embrace the online learning platform, fostering student engagement and educator satisfaction. This alignment with user behaviour is vital for the project's successful implementation and sustained growth in the competitive educational landscape.

Behavioural feasibility assesses the probability of users, comprising both students and educators, to accept and embrace a proposed online learning platform. It involves comprehending and analyzing various facets of user behavior to determine their openness

and willingness to engage with the platform. Here's an in-depth exploration of the components involved in behavioural feasibility.

User Preferences and Habits: Behavioural feasibility starts by examining the preferences, habits, and behaviours of the target audience. This encompasses their preferred learning methods, devices, study routines, and interaction styles with digital educational platforms. By comprehending how users engage with online learning platforms, educational institutions can customize their offerings and learning experiences to better align with student needs and expectations.

Comfort with Digital Transactions: Evaluating users' comfort levels with digital learning tools is crucial for the success of the online learning platform. This involves assessing factors such as trust in online learning platforms, previous experiences with digital learning environments, and attitudes towards sharing personal and academic information online. Addressing concerns related to usability and accessibility can help alleviate barriers to adoption and encourage users to engage more confidently with the platform.

Receptiveness to New Features: Behavioural feasibility also involves assessing users' openness to new features and functionalities offered by the online learning platform. Features such as personalized learning recommendations, interactive learning tools, intuitive navigation, and seamless access to resources can enhance user satisfaction and promote engagement. Understanding which features resonate most with users can guide prioritization and development efforts.

Instructor Engagement and Adaptability: In addition to student behaviour, behavioural feasibility considers the attitudes and adaptability of instructors who will be using and supporting the online learning platform. This includes evaluating their willingness to embrace new teaching methods, digital tools, and technologies for tasks such as content creation, assessments, communication, and student engagement. Providing adequate training and support can help ensure instructor buy-in and facilitate smooth transitions to online teaching.

User Feedback and Testing: Gathering user feedback through surveys, focus groups, usability testing, and analytics helps validate assumptions and identify areas for

improvement. By involving users, including students and instructors, in the development process and incorporating their input, educational institutions can create more user-centered experiences that resonate with their target audience.

Alignment with User Behaviour: Ultimately, a positive behavioural feasibility analysis indicates that the online learning platform aligns well with user behavior, preferences, and expectations. It suggests that the platform is likely to be embraced by both students and instructors, leading to increased engagement, improved learning outcomes, and enhanced instructor satisfaction. This alignment is crucial for driving adoption, retention, and sustained growth in the competitive online education landscape.

CHAPTER 3

SYSTEM DESIGN

System design in the development process of an online learning platform is a crucial phase where the conceptual requirements identified during the analysis stage are translated into a structured and functional system. This phase is focused on creating a blueprint or roadmap for the online learning solution that will effectively meet the educational institution's needs. Here's a more detailed explanation of the primary and secondary design phases.

Primary Design Phase:

Block-Level Design: At this stage, the system is designed at a high level, often referred to as the architectural or module level. The primary objective is to define the overall structure of the system by breaking it down into smaller functional units or modules. Each module represents a specific aspect or component of the online learning platform.

Functionality Mapping: The blocks are created based on the analysis conducted during the problem identification phase. This involves mapping the identified requirements to corresponding functional blocks, ensuring that each block serves a distinct purpose or function within the system.

Minimizing Information Flow: Emphasis is placed on minimizing the information flow between blocks to promote modularity, encapsulation, and maintainability. Activities that require close interaction or dependency are grouped together within the same block, while those with minimal interaction are kept separate.

High-Level Design Documentation: Documentation is crucial during this phase to capture the high-level design decisions, block diagrams, data flow diagrams, and other architectural artefacts. These documents serve as a reference for developers and stakeholders throughout the software development lifecycle.

Secondary Design Phase:

Detailed Design: Once the high-level architecture is established, the focus shifts to the detailed design of each individual block or module identified during the primary design phase. This involves defining the internal structure, interfaces, algorithms, data structures, and implementation details for each block.

Refinement and Optimization: The detailed design phase allows for further refinement and optimization of the system architecture. Design decisions made during this phase may involve trade-offs between factors such as performance, scalability, flexibility, and maintainability.

Interface Design: Special attention is given to designing clear and well-defined interfaces between different modules or subsystems. Interface specifications include input parameters, output formats, error handling mechanisms, and communication protocols to ensure seamless interaction between components.

Design Review and Validation: Design artifacts undergo review and validation by stakeholders, including developers, architects, project managers, and instructors. Feedback from reviews is incorporated into the design to address any issues or concerns and ensure alignment with project objectives. Overall, the system design phase plays a crucial role in laying the foundation for the online learning platform, guiding the development process, and facilitating effective communication between stakeholders. By translating requirements into a structured design, organizations can minimize risks, streamline development efforts, and deliver a robust and scalable online learning platform that meets user expectations.

The general tasks involved in the design process are:

- Design various blocks for overall system processes.
- Design smaller, compact and workable modules in each block.
- Design various database structures.
- Specify details of programs to achieve desired functionality.
- Design the form of inputs, and outputs of the system.
- Perform documentation of the design.
- System reviews.

3.1 User Interface

User interface (UI) design for CodeX encompasses creating an intuitive and visually engaging platform that enhances the learning experience for students and instructors. Here's a deeper exploration of user interface design:

Visual Design: Visual design focuses on crafting an appealing interface that reflects CodeX's educational ethos. This includes selecting color palettes, typography, icons, and graphical elements to ensure clarity and enhance engagement while maintaining a professional aesthetic.

Layout and Organization: UI designers arrange interface elements logically to facilitate seamless navigation and interaction. This involves designing the layout of course pages, navigation menus, buttons, forms, and interactive components to streamline the learning process and facilitate easy access to educational resources.

Information Architecture: Information architecture involves structuring and organizing the content within the interface to make it easily accessible and understandable. This includes categorizing information, creating hierarchies, and defining navigation pathways to ensure users can find what they need efficiently. Clear labeling and descriptive terminology are essential for effective information architecture.

Interaction Design: Interaction design focuses on defining how users interact with the interface and guiding them through various tasks and workflows. This includes designing interactive elements such as buttons, dropdown menus, checkboxes, and input fields, as well as defining user flows and sequences of actions. Interaction design aims to create seamless and intuitive interactions that minimize friction and cognitive load for users.

Usability and Accessibility: Usability and accessibility are core principles of UI design, ensuring that interfaces are easy to use and accessible to all users, including those with disabilities. Design considerations may include providing alternative text for images, implementing keyboard shortcuts, optimizing for screen readers, and adhering to accessibility Standards such as WCAG (Web Content Accessibility Guidelines).

Responsive Design: With the increasing prevalence of mobile devices and varying screen sizes, UI designers must prioritize responsive design principles. This involves designing interfaces that adapt and respond gracefully to different screen sizes and resolutions, ensuring a consistent user experience across desktop, tablet, and mobile devices.

Feedback and Error Handling: UI design includes incorporating feedback mechanisms and error handling strategies to provide users with clear guidance and feedback throughout their interactions. This may involve displaying success messages, error alerts, progress indicators, and confirmation prompts to keep users informed and reassured.

User Testing and Iteration: UI design is an iterative process that involves gathering feedback from users through usability testing, user interviews, and analytics. Designers use this feedback to refine and improve the interface iteratively, addressing usability issues, identifying pain points, and optimizing the user experience over time.

The following steps are various guidelines for User Interface Design:

- The system user should always be aware of what to do next.
- The screen should be formatted so that various types of information, instructions and messages always appear in the same general display area.
- Message, instructions or information should be displayed long enough to allow the system user to read them.
- Use display attributes sparingly.
- Default values for fields and answers to be entered by the user should be specified.
- A user should not be allowed to proceed without correcting an error.
- The system user should never get an operating system message or fatal error.

CHAPTER 4

SOFTWARE REQUIREMENT SPECIFICATION

The product specified in the SRS document is a software application for an online education platform called CodeX. It is designed to facilitate the creation, consumption, and rating of educational content. Let's delve into the key components and functionalities.

Our product interacts with the users over the internet and can be accessed through a web browser. It is being used in a time where student do not have the time to physically visit the institute and are willing to pay more money if the programming courses.

4.1 Product Requirement:

The CodeX platform described here is a software application designed to facilitate online education operations for both students and instructors. Let's break down the key components and functionalities:

Course Creation and Management: Instructors can create and publish courses on various subjects, including lectures, assignments, quizzes, and assessments. They have the flexibility to organize course materials, set up learning objectives, and track student progress.

Content Discovery: Students can browse through available courses, search for specific topics, and discover educational content based on their interests. They can view detailed course descriptions, instructor profiles, and course ratings to make informed decisions about enrollment.

Enrollment and Participation: Students can enroll in desired courses, access course materials, and participate in discussions, assignments, and quizzes. They can interact with instructors and peers through the platform's communication features and track their progress within enrolled courses

Interactive Course Purchasing: The CodeX platform facilitates online transactions, enabling students to securely enroll in courses using various payment methods, including credit/debit cards, digital wallets, or other online payment gateways. Students can provide

their enrollment information and select their preferred payment method during the checkout process.

Internet-Based Selling: CodeX operates entirely over the internet, serving as the primary platform for delivering educational content to students. This means that both course access and interactions occur online, providing flexibility and accessibility to learners from anywhere with internet connectivity.

Administrator Roles and Permissions: The system defines the role of an administrator with special permissions to manage the CodeX platform. Administrators can access backend functionalities to perform tasks such as adding new course categories, updating course information, managing student enrollments, and generating analytical reports.

4.2 User and Characteristics:

For this application, we defined two type of user.

Student: Students are individuals who engage with the online platform to access educational content, enroll in courses, and participate in learning activities facilitated by instructors.

Instructor: Instructors are individuals responsible for creating and delivering educational content on the CodeX platform. They have special privileges and responsibilities for managing courses, interacting with students, and facilitating the learning experience.

The characteristics of each of the user are:

- 1) Anyone can register as Instructor & Student.
- 2) A student can view and enrol in multiple courses.
- 3) An instructor has the power to add/delete any course and can also edit course informations.

4.3 Operating environment:

In addition to the MongoDB database storing data related to courses, user profiles, and other project details, the operating environment for the CodeX platform encompasses several key components. The hardware requirements to run this application include a robust server infrastructure capable of supporting the MongoDB backend and handling concurrent user requests. Adequate storage capacity and processing power are necessary to ensure optimal performance and scalability as the application's database grows.

Moreover, the software components of the system are developed using Visual Studio Code IDE with JavaScript programming language. Visual Studio Code provides a versatile development environment for building robust and scalable applications, while JavaScript offers flexibility and strong support for asynchronous programming, making it suitable for developing interactive web applications.

Given that the application will be online, it is crucial to consider factors such as network connectivity, bandwidth, and server uptime to ensure uninterrupted access for users. Implementing measures for load balancing, redundancy, and failover can enhance the reliability and availability of the application, minimizing downtime and optimizing user experience.

Furthermore, the application's online accessibility implies compatibility with a wide range of devices, including personal computers, laptops, and handheld devices such as smartphones and tablets. Therefore, the user interface design should prioritize responsiveness and adaptability to different screen sizes and resolutions, ensuring a consistent and user-friendly experience across devices.

In summary, the operating environment for this project encompasses a combination of hardware and software components, including a MongoDB backend, Visual Studio Code IDE with JavaScript development, robust server infrastructure, reliable network connectivity, and cross-device compatibility. By addressing these aspects comprehensively, the application can effectively meet the needs of users while maintaining scalability, performance, and accessibility in an online environment.

Organization Background:

Given the current challenges in the educational sector, including the impact of the COVID-19 pandemic, our project aims to address the evolving needs of students and educators alike. With financial constraints affecting many institutions and individuals, access to quality education has become increasingly important yet challenging.

To overcome these obstacles, our project utilizes innovative solutions to promote online learning and engagement. Leveraging social media platforms, we facilitate communication with students and gain valuable insights into their learning preferences and requirements. Additionally, we have developed a dedicated website to provide students with easy access to educational resources, course materials, and the latest updates.

As active participants in this project, we have observed varied responses from students regarding these initiatives. While some students appreciate the convenience and flexibility offered by online learning platforms, others may have reservations based on factors such as age, technological literacy, or personal preferences. Nonetheless, our project remains committed to enhancing the learning experience for all students and adapting to their evolving needs and preferences.

The platform enables students to create a list of courses they wish to enroll in, metaphorically referred to as "adding courses to the cart." When ready to enroll, students proceed to the checkout process, where the platform calculates the total cost of the selected courses. This total includes any applicable fees, such as enrollment charges, administrative fees, and taxes.

4.4 Features of the project:

User Registration: This feature enables new users to create accounts on the CodeX platform by providing essential information such as username, email address, password, and optionally additional details like name, educational background, and interests.

User Login System: Once registered, users can log in to their accounts using their credentials (username/email and password). The login system verifies user credentials and grants access to personalized features and educational content available on the platform.

Change Password: Users have the option to change their passwords for security reasons or personal preference. This feature typically requires users to authenticate themselves by entering their current password before setting a new one.

Forgot Password: In case users forget their passwords, this feature allows them to reset their passwords by providing their registered email address or username. The system sends a password reset link or temporary password to the user's email address, allowing them to regain access to their account.

Profile Management System: This feature enables users to manage their profile information, including updating personal details, adding or editing educational background, managing communication preferences (e.g., email notifications), and tracking their learning progress.

Course Enrollment: Users can browse available courses on the CodeX platform and enroll in courses of interest. The platform provides detailed information about each course, including course description, instructor details, curriculum, and enrollment options.

Learning Dashboard: Users have access to a personalized learning dashboard where they can view enrolled courses, track their progress, access course materials, submit assignments, participate in discussions, and view grades and feedback from instructors.

Course rating & reivews: After completing a course, users can provide ratings and reviews based on their learning experience. This feedback helps other users make informed decisions when selecting courses and provides valuable insights for instructors and platform administrators.

4.5 Features of Admin:

Manage Content: This functionality empowers administrators to create, edit, and delete educational content on the CodeX platform. Administrators can add new courses, modules, or learning materials by entering details such as title, description, category, and uploading relevant files or resources. Additionally, administrators can remove outdated or irrelevant content from the platform.

Monitor users activity: Administrators have access to user activity logs, allowing them to track user interactions, course enrollment, completion rates, and engagement metrics. This feature provides insights into user behavior and helps administrators identify areas for improvement in the platform's offerings and user experience.

Manage Instuctor Profile: Administrators can oversee instructor profiles, including adding new instructors, updating existing profiles, and removing inactive instructors. This functionality ensures that instructor information remains accurate and up-to-date, facilitating effective communication between instructors and students.

Analytics & Reporting: Administrators can generate reports and analytics to assess the platform's performance, user engagement, and course effectiveness. This feature includes metrics such as user demographics, course completion rates, assessment scores, and feedback from users. Analytics and reporting tools enable administrators to make data-driven decisions to enhance the platform's effectiveness and meet educational objectives.

Security & Access Control: Administrators can manage user access and permissions, ensuring that only authorized individuals have access to sensitive administrative functions and data. This includes setting user roles, defining access levels, and implementing authentication measures to safeguard against unauthorized access or data breaches. Security and access control features help maintain the integrity and confidentiality of the platform's data and operations.

Signing Up for a User Account: This feature enables new users to sign up for an account on the CodeX platform. Users provide essential information such as username, email address, password, and optionally additional details like name and contact information during the registration process.

Change Email ID and Password: Registered users can manage their profile information,

including updating personal details, changing their email address or password, and configuring communication preferences. This functionality ensures that user accounts remain up-to-date and personalized according to individual preferences.

Browsing & Enrolling in Courses: Users can browse the catalog of available courses on the CodeX platform, view detailed course descriptions, and enroll in courses of interest. The platform provides users with access to a diverse range of educational content across various subjects and topics.

Interactive Learning Experience: CodeX offers an interactive learning experience for users, allowing them to engage with course materials through multimedia content, interactive quizzes, assignments, and discussions. Users can track their progress, complete assessments, and interact with instructors and fellow learners.

Accessing Courses Materials: Once enrolled in a course, users can access course materials such as lectures, videos, readings, and supplementary resources. The platform ensures easy navigation and seamless access to learning materials, enhancing the overall learning experience for users.

Online Learning Platform: This entity represents the entire online learning system, comprising various components and functionalities designed to facilitate educational activities.

Student - The student entity encompasses the individuals who will be utilizing the online learning platform. Students are the primary users for whom the system is developed. The attributes associated with this entity include:

Name - This attribute stores the name of the student, which is used for identifying and referencing users within the system. It comprises two sub-attributes: First Name and Last Name, capturing the user's complete name.

Student-id - This is the identification number assigned by the admin to the users so as to identify them uniquely in the future. This identification number is helpful in fetching data of the individual user from a big set. This is mainly to manage the huge database system where the entire data is being stored.

Address - This is the user's address where the user lives so that to use it at the time of delivery or any further requirements. This is also a composite attribute that is divided into address1 and address2. These address1 contains house no. and lane no., whereas the address2 field is applicable for containing city and state address.

Email-id - It involves the email address of the user, which can be used for sending advertisements or offers, to the user in the future, once the user becomes a part of the family and has signed up to the website. The user should enter a valid email address and not a fraudulent one, as the email id is verified at the time of sign-up only.

Contact-no - This is the user's mobile no., or any landline number, through which the user can be asked for confirmation at the time of placing an order, or it can also be used at times when the user has any query or feedback.

Product - This entity represents the coding courses available for enrollment on the CodeX online learning platform. Users can add courses to their cart and proceed with the enrollment. The attributes associated with this entity are:

Course-Id - This is the unique product identifier assigned to the items in the store so as to uniquely identify them, in condition if two products have the same name are available in the store. At that time the Instructor will update the record of the product based on this identity number, in the database.

Price - It is one of the most important attributes since most of the time people change their course list contents depending upon their needs and economic situation. So, for them to know the actual MRP is most important in making decisions for what to buy and what not to make informed decisions about their educational investments.

Cart - Users have the option to add courses to their cart for later review and enrollment. The cart functionality enables users to temporarily reserve their selected courses during their browsing session, similar to a wish list feature.

Quantity - This attribute tracks the number of courses selected by the user for enrollment. It helps users keep track of their chosen courses and assists the platform in managing inventory and enrollment records.

Cart-id - Each cart is assigned a unique identifier to distinguish individual carts and manage their data effectively. This attribute aids in organizing user-specific cart information within the system.

Total - The total attribute calculates the cumulative price of all courses added to the cart, providing users with a comprehensive overview of their potential enrollment cost.

Payment - It defines the payment to be done by the customer for purchasing the Courses from the web store at a worthwhile price. Also, various security encryption mechanisms have been used, so the student details of accounts and other credentials are safe and secure.

Mode - The user is provided with lots of options that he/she can opt for making the payment depending upon their ease. There are many choices available for net banking, use of wallets like pay and I-cash cards, also credit card and debit card options are available too.

Amount - It is the record of the total sum amount the user needs to pay, and after the payment, it is used to update the server-side database to keep the record of the net profit or loss on daily basis.

CHAPTER 5

SYSTEM REQUIREMENT

System requirements refer to the specifications and capabilities that a computer system, software application, or hardware device must meet or exceed to effectively perform its intended functions. These requirements are typically defined during the planning and design phase of a project and serve as guidelines for system development, deployment, and operation.

Functional and non-functional requirements are two essential types of specifications that define the features and characteristics of a system, such as an online educational web application.

5.1 Functional Requirement:

Functional requirements define the specific functionalities or features that a software system must provide to meet the needs of its users and fulfill its intended purpose. These requirements describe what the system should do in terms of inputs, processes, and outputs. Here's a more detailed explanation of functional requirements in the context of an online educational web application:

User Enrollment: This requirement specifies that the system should allow users to create accounts with unique usernames and passwords. It includes functionality for capturing user registration information, validating input data, and storing user credentials securely in a database. The output of this process is a registered user account that grants access to course materials and platform features

Course Catalogue: The functional requirement for the course catalog mandates the presence of a comprehensive catalog showcasing available coding courses. It encompasses features like browsing, searching, and filtering courses by criteria such as programming language, skill level, or course duration. The result is a user-friendly interface presenting course details including title, description, duration, and instructor information.

Enrollment Cart: Users should be able to add products to a virtual enrollment cart, view the contents of the cart, and proceed to checkout when ready to make a purchase. This requirement involves designing interactive features for managing the enrollment cart, including adding and Removing courses and calculating subtotal and total prices. The output is an updated enrollment cart in multiple course reflecting the user's selections.

Enrollment Management: The system should support the creation, processing, and tracking of courses placed by student. This includes functionality for generating order forms, capturing order details such as course selections and access information, and updating enrollment status throughout the fulfilment process. The output includes order confirmation emails, invoices, and course access notifications.

Payment Processing: Integration with payment gateways is required to facilitate secure and reliable online transactions. Functional requirements for payment processing involve capturing payment details, verifying transaction authenticity, and processing payments securely. The output includes payment confirmation messages and transaction receipts.

User Authentication: Users should be able to log in securely to access their accounts and log out when necessary. This requirement encompasses features such as user authentication, session management, and password security. The output is a secure login mechanism that verifies user credentials and grants access to authenticated users while protecting against unauthorized access.

5.2 Non-Functional Requirement:

Non-functional requirements, also known as quality attributes or system attributes, define the attributes or characteristics of a software system that are not directly related to its functionality but are crucial for ensuring its overall quality, performance, and user experience. Let's delve deeper into each non-functional requirement for an online educational web application and add some related content:

Performance: This requirement specifies the expected response time for user actions, such as page loading times and transaction processing times. Performance testing can measure the system's responsiveness under various conditions, ensuring that it meets performance

expectations even during peak usage periods such as when exams are coming or interviews are conducting by the placement companies.

Scalability: Scalability refers to the ability of the application to handle increased workload and user traffic as the user base grows. The system should be designed to scale horizontally or vertically to accommodate additional users, courses, and transactions without compromising performance or reliability.

Reliability: Reliability ensures that the system operates consistently and predictably, with minimal downtime and errors. This includes implementing fault-tolerant mechanisms, redundant infrastructure, and automated failover processes to maintain system availability and recover from failures quickly.

Security: Security is paramount for protecting user data, especially personal and financial information, from unauthorized access, manipulation, or theft. This involves implementing encryption, access controls, authentication mechanisms, and secure communication protocols to safeguard sensitive data throughout the application.

Usability: Usability focuses on the user interface design and overall user experience, aiming to make the application intuitive, easy to navigate, and visually appealing. Usability testing can identify areas for improvement in terms of layout, navigation flow, accessibility features, and responsiveness across different devices and screen sizes.

User Authentication: User authentication ensures that only authorized users can access the application and its features. This involves implementing strong password policies, multi-factor authentication, session management, and secure logout mechanisms to protect user accounts from unauthorized access or misuse.

Additionally, some other non-functional requirements that may apply to an online educational web application include:

Compatibility: The application should be compatible with various web browsers, operating systems, and devices to ensure a consistent user experience across different platforms.

Maintainability: The system should be designed and developed in a modular and well-structured manner, making it easy to maintain, update, and extend over time.

Compliance: The application should comply with relevant laws, regulations, and industry standards, such as GDPR for data protection or PCI DSS for payment card security, to ensure legal and regulatory compliance.

5.3 Design Goal

Our design goal for CodeX the Ed-tech platform, is to establish a seamless and immersive learning environment, placing paramount importance on user experience and engagement. Emphasizing accessibility and interactivity, our aim is to develop an intuitive interface that facilitates effortless navigation and content consumption. The platform's design will focus on enhancing the learning journey, enabling users to easily create, discover, and rate educational content.

Our objective is to capture users' interest and facilitate informed decision-making throughout their learning experience. The platform's interface will offer a frictionless journey, with an intuitive content creation process, clear presentation of educational materials, and transparent communication channels. Multiple engagement options, such as ratings and reviews, will empower users to contribute to the platform's ecosystem actively.

Ensuring responsiveness across devices is imperative, guaranteeing a consistent and enjoyable experience for users accessing the platform from various devices and screen sizes. Performance optimization measures, including swift loading times and seamless interactions, will be implemented to sustain user engagement and satisfaction.

Use Case Diagram

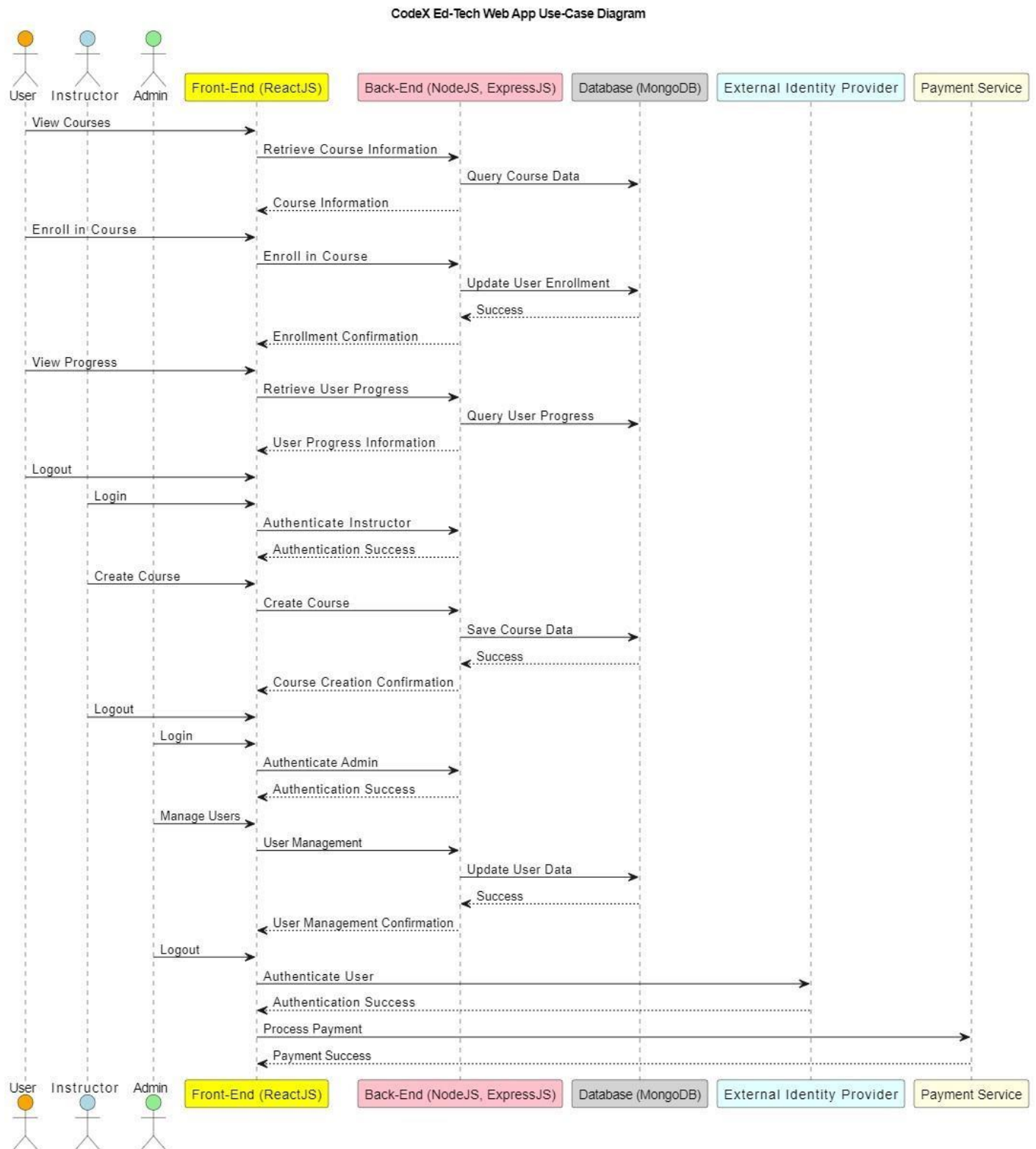


Fig 5.4: Use Case Diagram

ER Diagram:

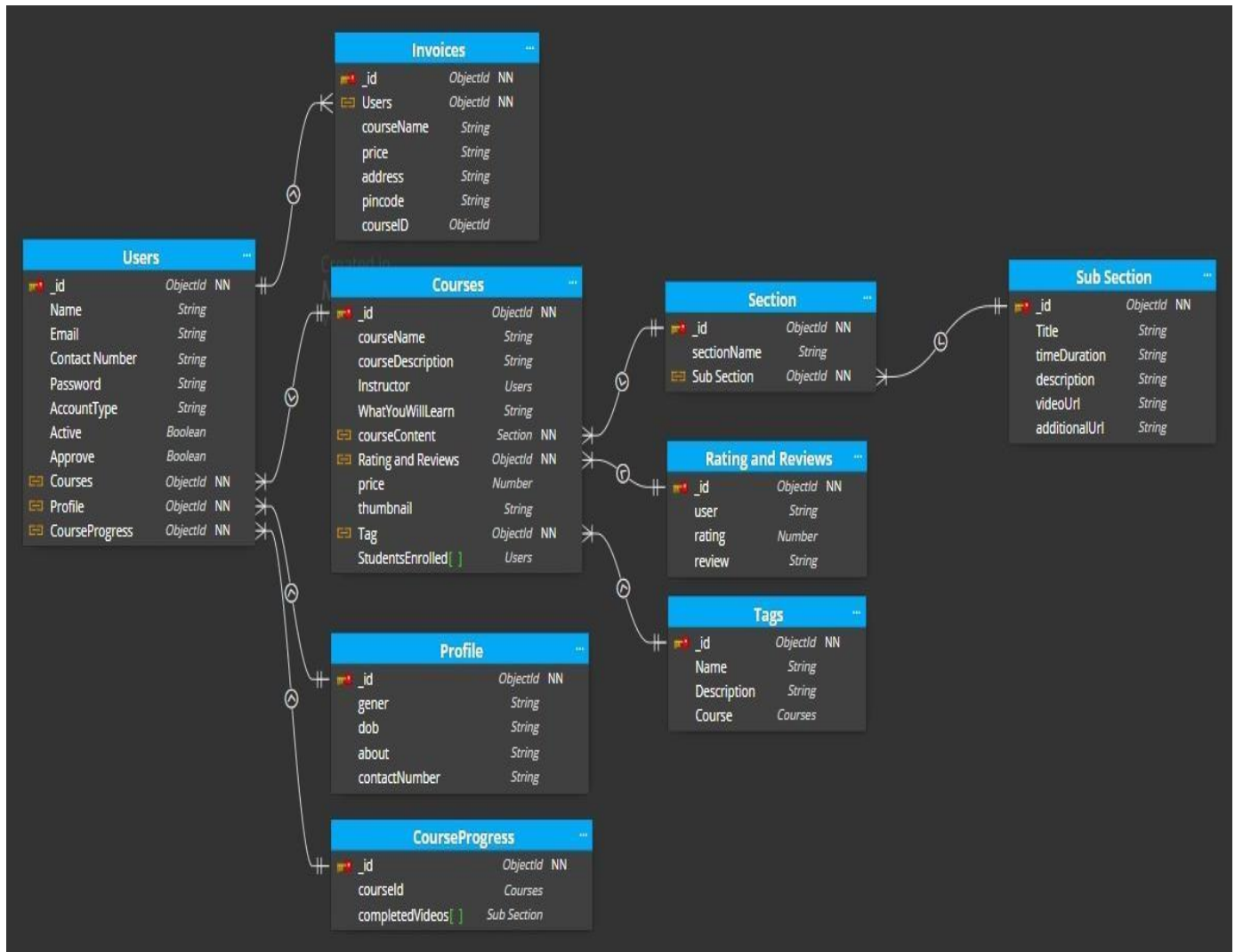


Fig 5.5: ER- Diagram

Data Flow Diagram

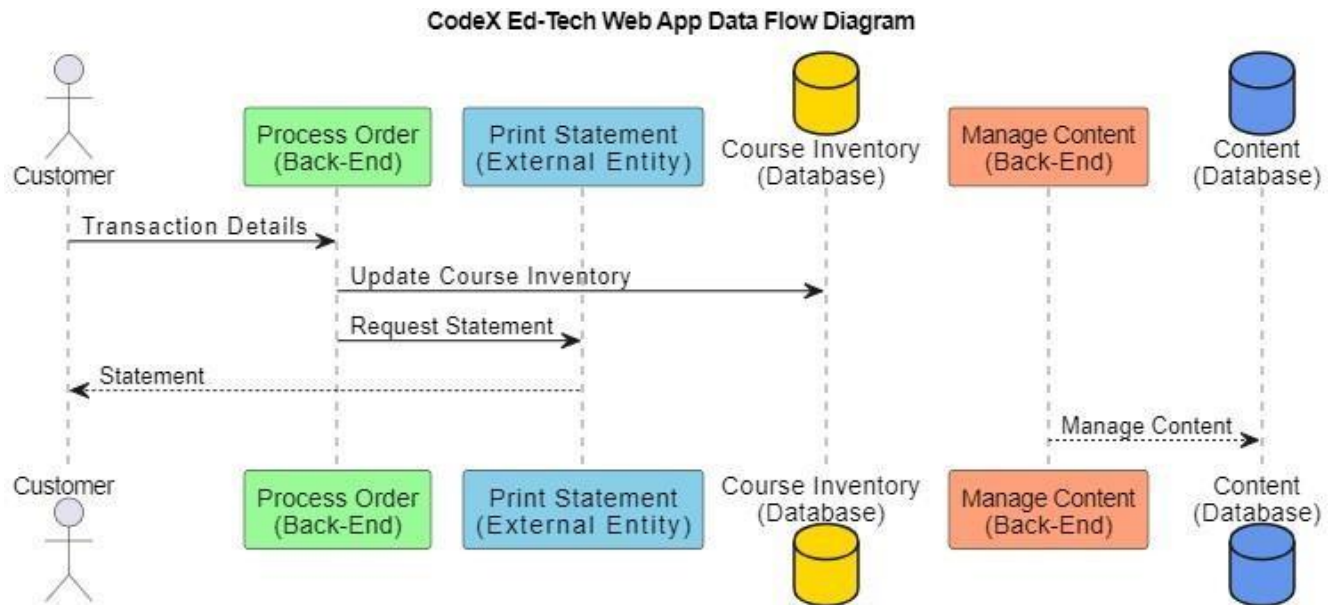


Fig 5.6: Data Flow Diagram

Class Diagram

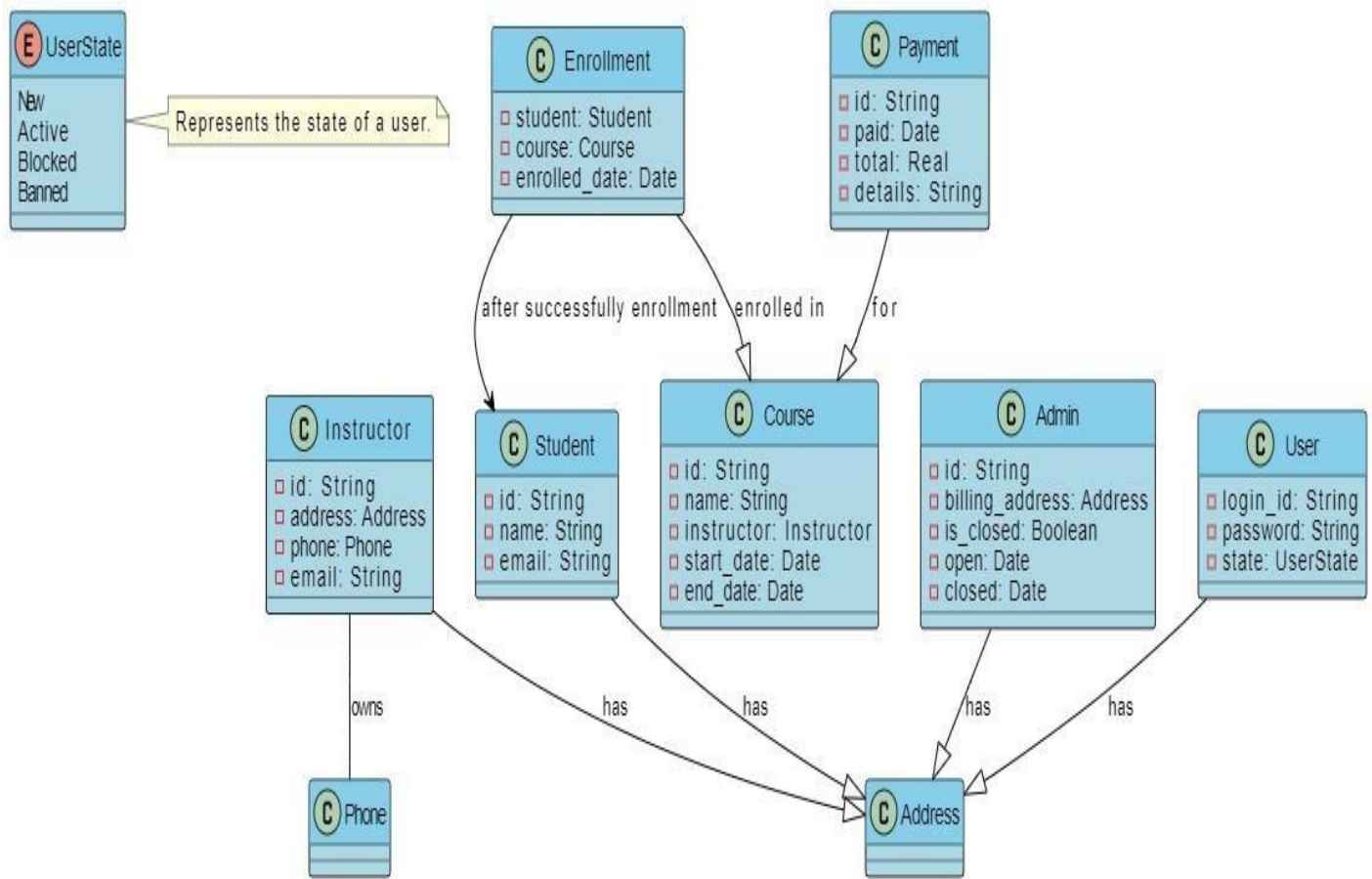


Fig 5.7 Class Diagram

Level 0 DFD Diagram

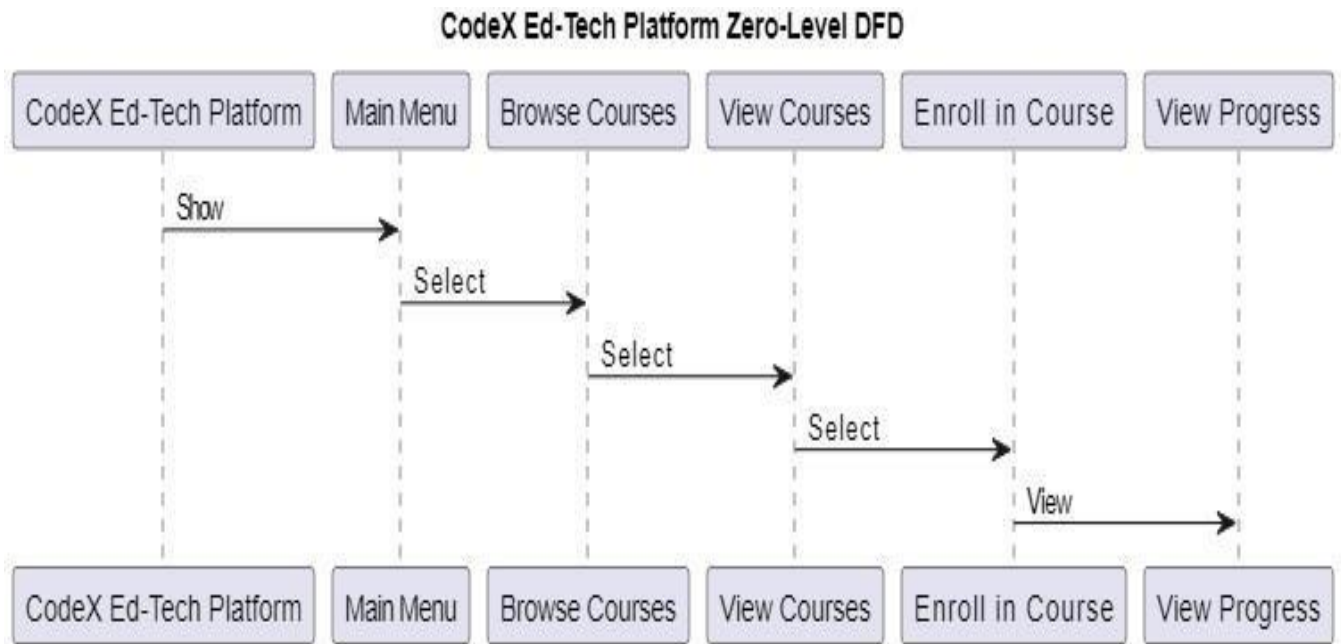


Fig 5.8 Level 0 DFD Diagram

Level 1 DFD Diagram

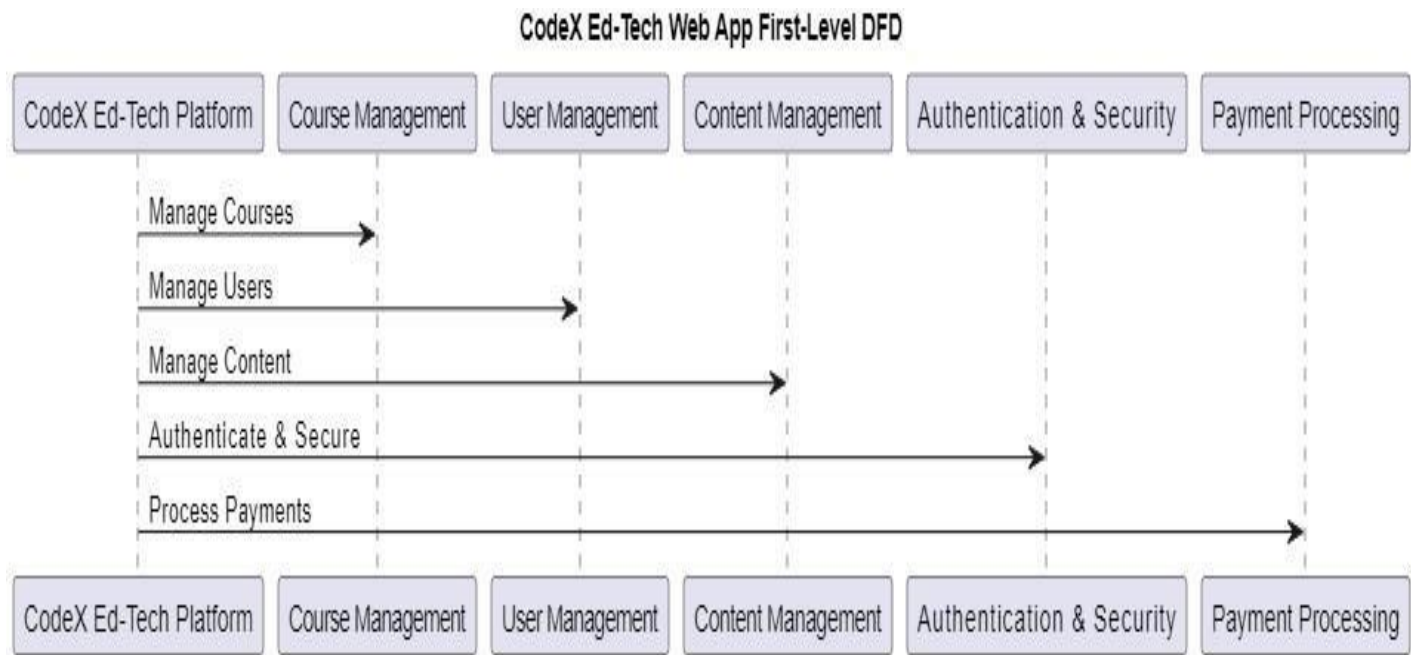


Fig 5.9 Level 0 DFD Diagram

Level 2 DFD Diagram

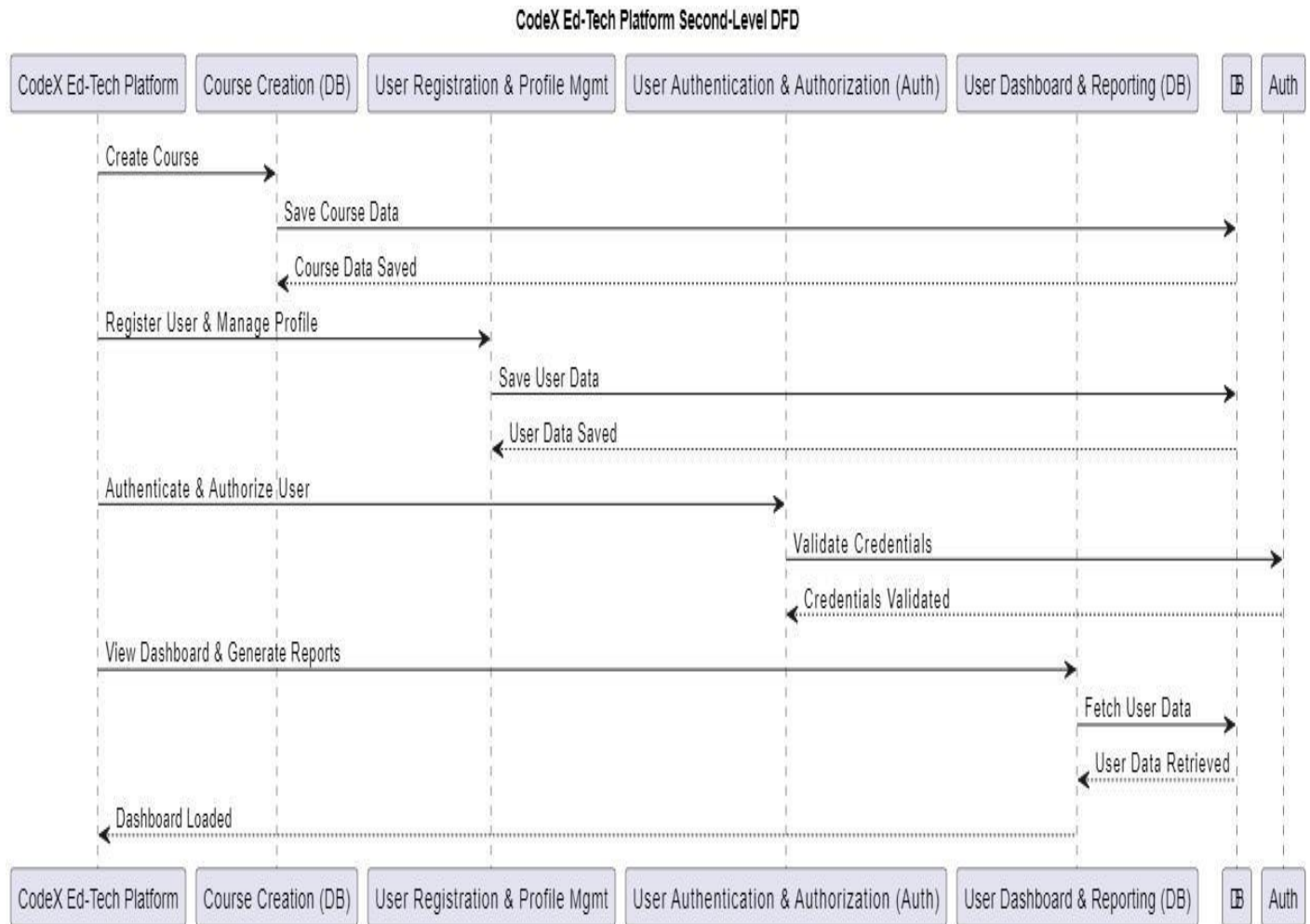


Fig 5.10 Level 2 DFD Diagram

CHAPTER 6

ARCHITECTURE

6.1 Layered Architecture:

The Layered architecture pattern, also referred to as the n-tier architecture pattern, is a fitting choice for CodeX, aligning with its objective to deliver a seamless and interactive learning experience for users. This architecture pattern is widely recognized and understood, making it suitable for the development of educational technology platforms like CodeX.

This pattern can be used to structure programs that can be decomposed into groups of subtasks, each of which is at a particular level of abstraction. Each layer provides services to the next higher layer.

The architecture comprises of the following three layers:

Presentation layer (also known as **UI layer**)

- The presentation layer is responsible for presenting information to the user and handling user interactions. It includes components such as user interfaces, web pages, forms, and graphical elements that users interact with.
- This layer focuses on delivering a visually appealing and intuitive user experience. It often involves technologies such as HTML, CSS, and JavaScript for web applications, and UI frameworks like React Js.
- The presentation layer communicates with the business logic layer to retrieve and display data, as well as to process user inputs and actions.

Business logic layer (also known as **domain layer**)

- The business logic layer contains the core business logic and rules that govern the behavior of the application. It encapsulates the business processes, calculations, validations, and workflows.
- This layer is responsible for implementing business rules and enforcing business policies. It ensures that business operations are performed accurately, consistently, and efficiently.

- The business logic layer often comprises services, entities, and business objects that represent real-world concepts and processes within the domain of the application.
- This layer is technology-agnostic and independent of specific data storage or presentation mechanisms, allowing for easier maintenance, scalability, and reusability of business logic components.

Data access layer (also known as **persistence layer**)

- The data access layer is responsible for accessing and manipulating data stored in the underlying data storage systems, such as databases, file systems, or external APIs.
- This layer handles tasks such as querying data, inserting, updating, and deleting records, and managing transactions and connections to the data source.
- The data access layer abstracts the details of data storage and retrieval, providing a consistent interface for the business logic layer to interact with different types of data sources.
- Common technologies used in the data access layer include Object-Relational Mapping (ORM) frameworks, NoSQL query languages for non-relational databases, and HTTP requests for accessing external APIs.

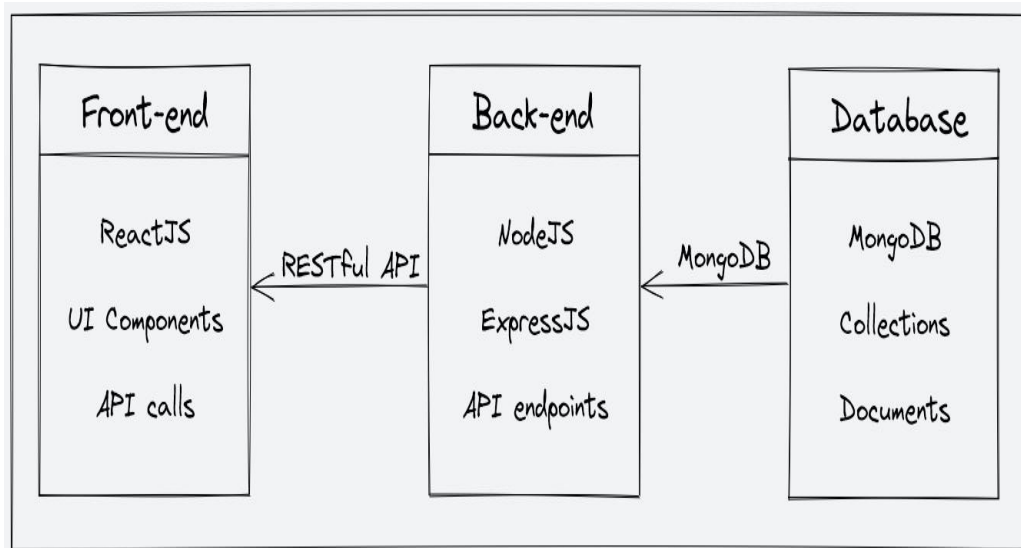


Fig 6.1: Architecture of Ed-tech CodeX web app

Project Screenshots

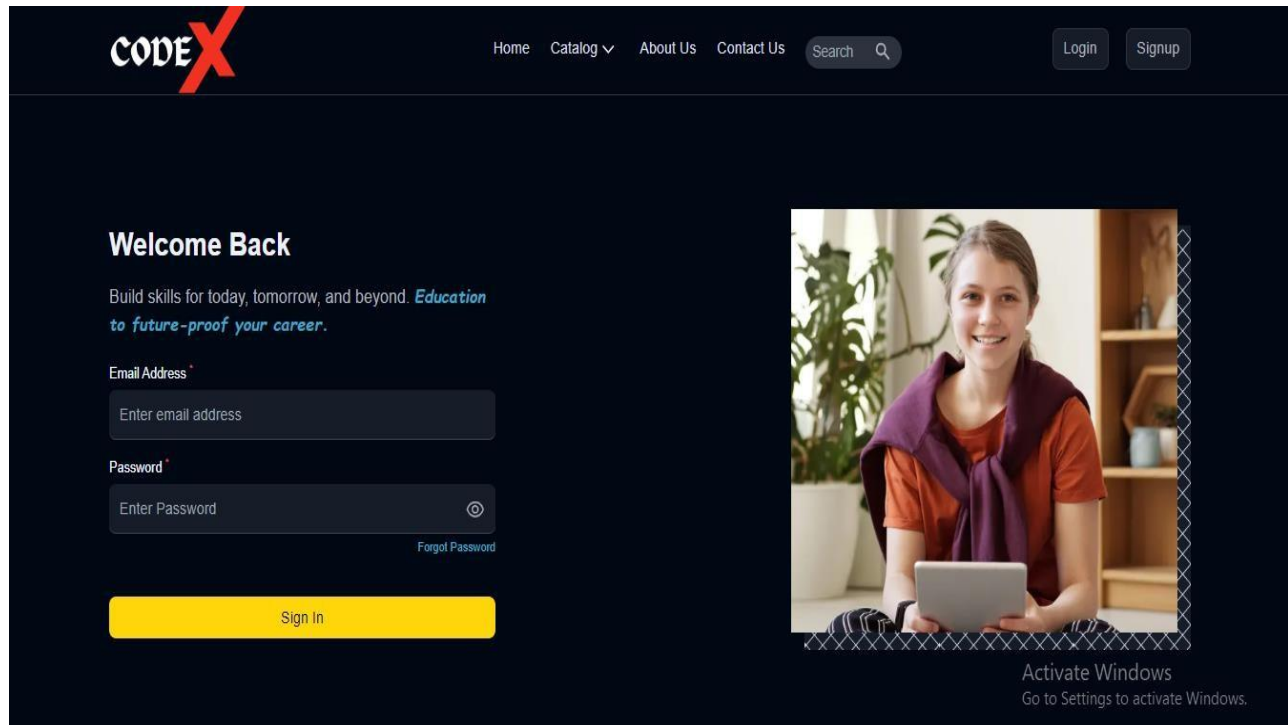


Fig 7.1 Login/Signup Page

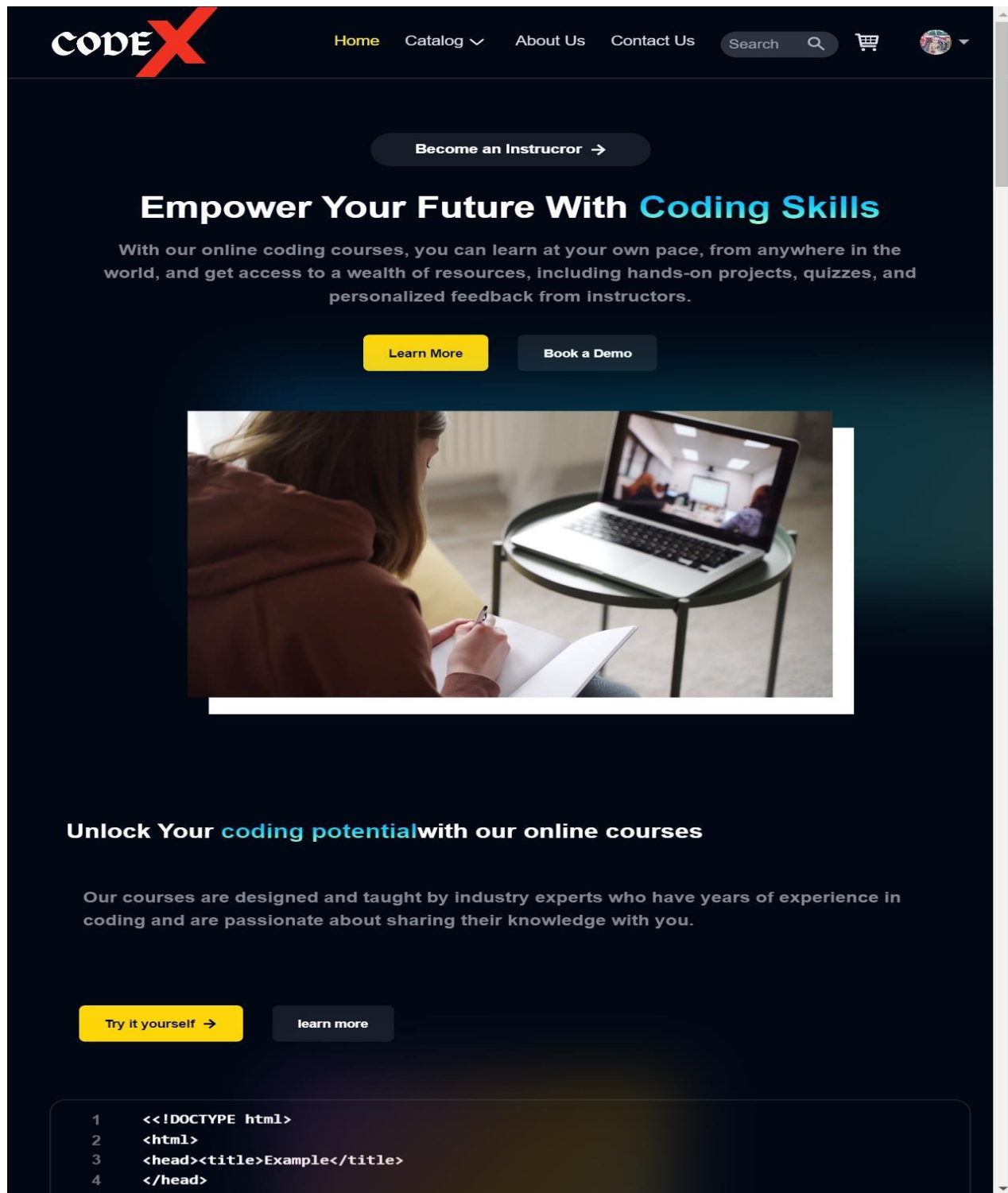




Fig 7.2 Home Page



HomeCatalog ▾About UsContact Us

Search 🔍🛒




Home / Catalog / Python

Python


This is course category for Python

Courses to get you started

Most PopulerNew






Python Crash Course
By Ashutosh Modanwal
0 ☆☆☆☆☆ 0 Ratings
Rs. 99



Python Crash Course
By Ashutosh Modanwal
5 ☆☆☆☆☆ 1 Ratings
Rs. 99

Fig 7.3 Course Details

CODEX[Home](#)[Catalog](#)[About Us](#)[Contact Us](#)





Python Crash Course

chalo python seekhe

0 ☆☆☆☆☆ (0 Reviews) 0 students enrolled

Created By Ashutosh Modanwal

 Created at: December 26, 2023  English

₹99

Buy Now

Add to Cart

What you'll learn


yaha python seekhe

Course Content

1 Section(s) 1 Lecture(s) [Collapse all sections](#)

▼ Introduction	1 Lecture(s)
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Author

**Ashutosh Modanwal**

Reviews

0 /5 (0 ratings) | 0 students

Fig 7.4 Checkout Page

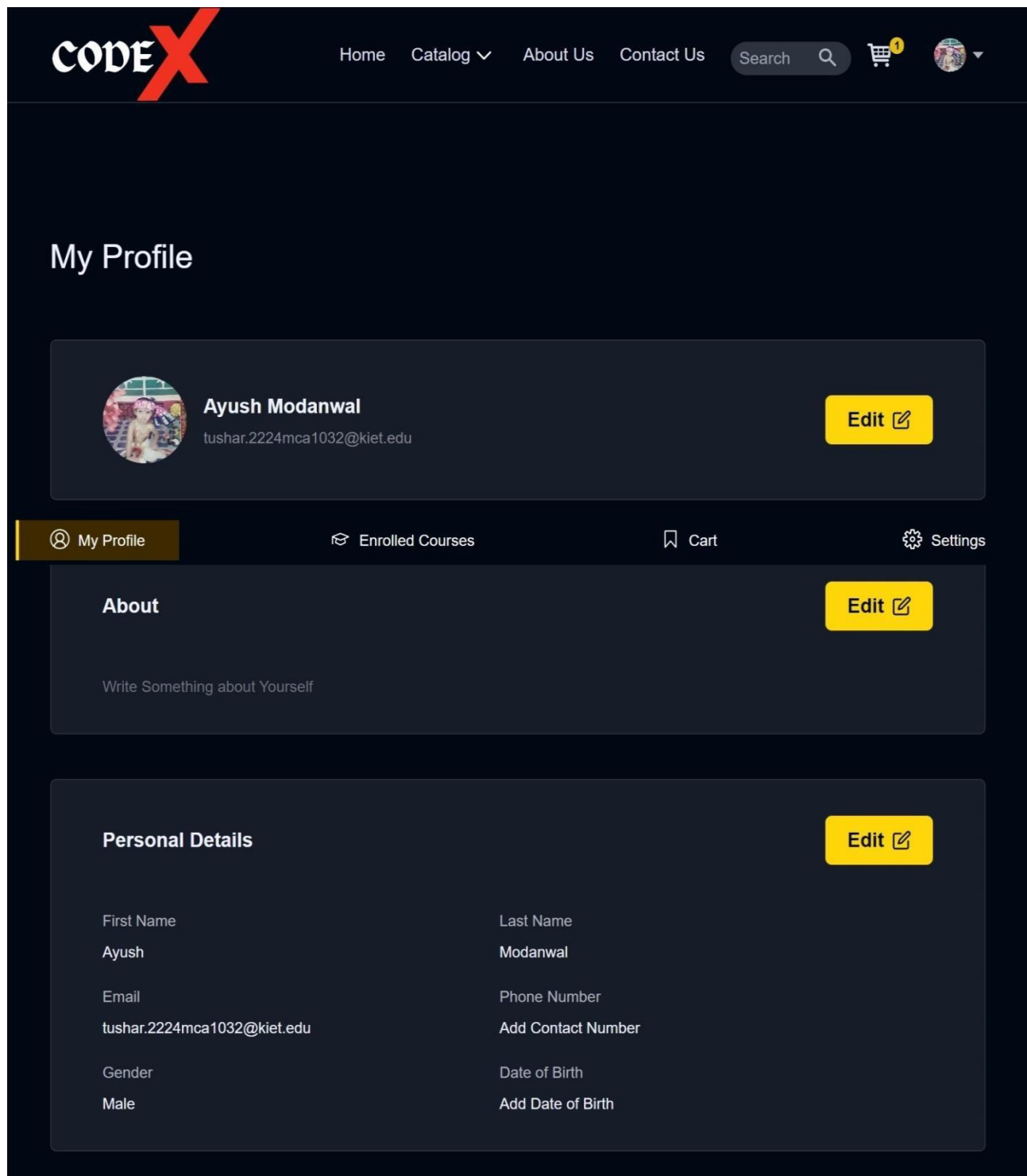


Fig 7.5 User Profile

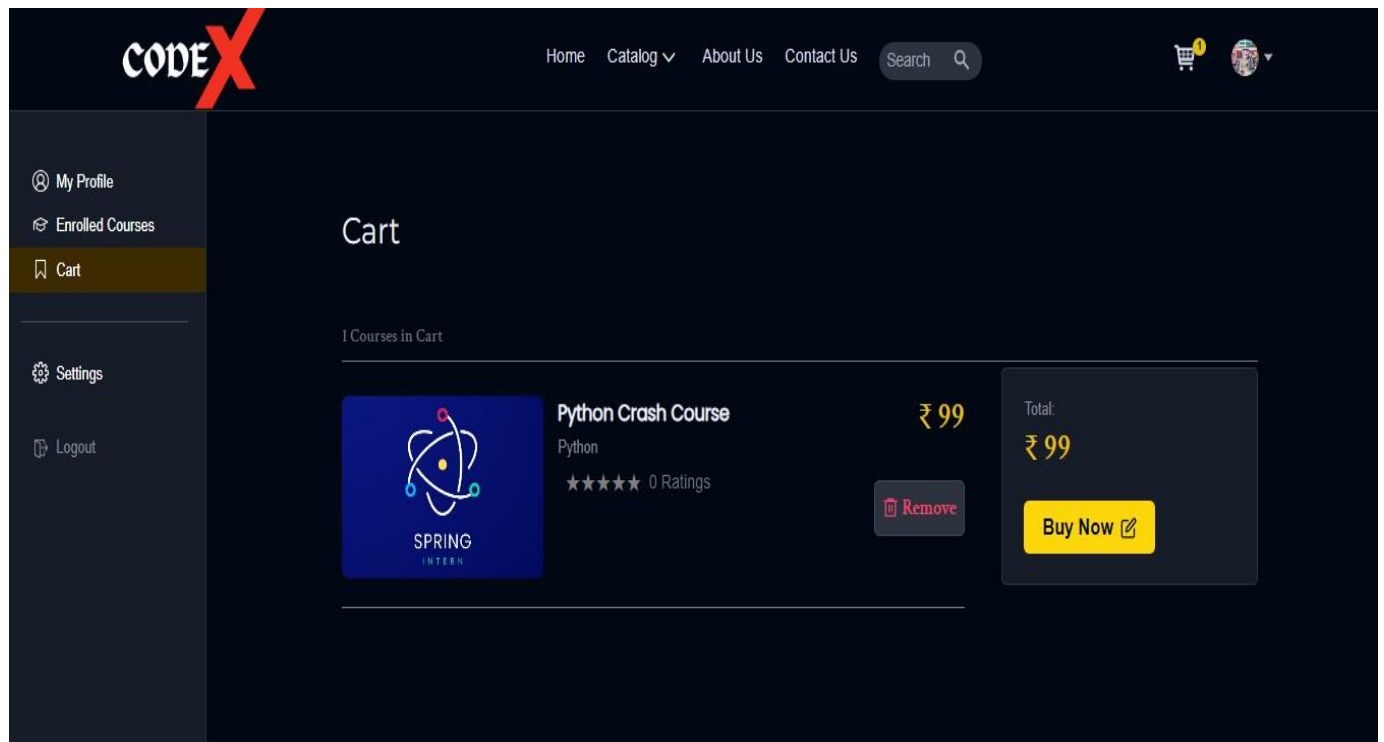


Fig 7.6 Order History Page

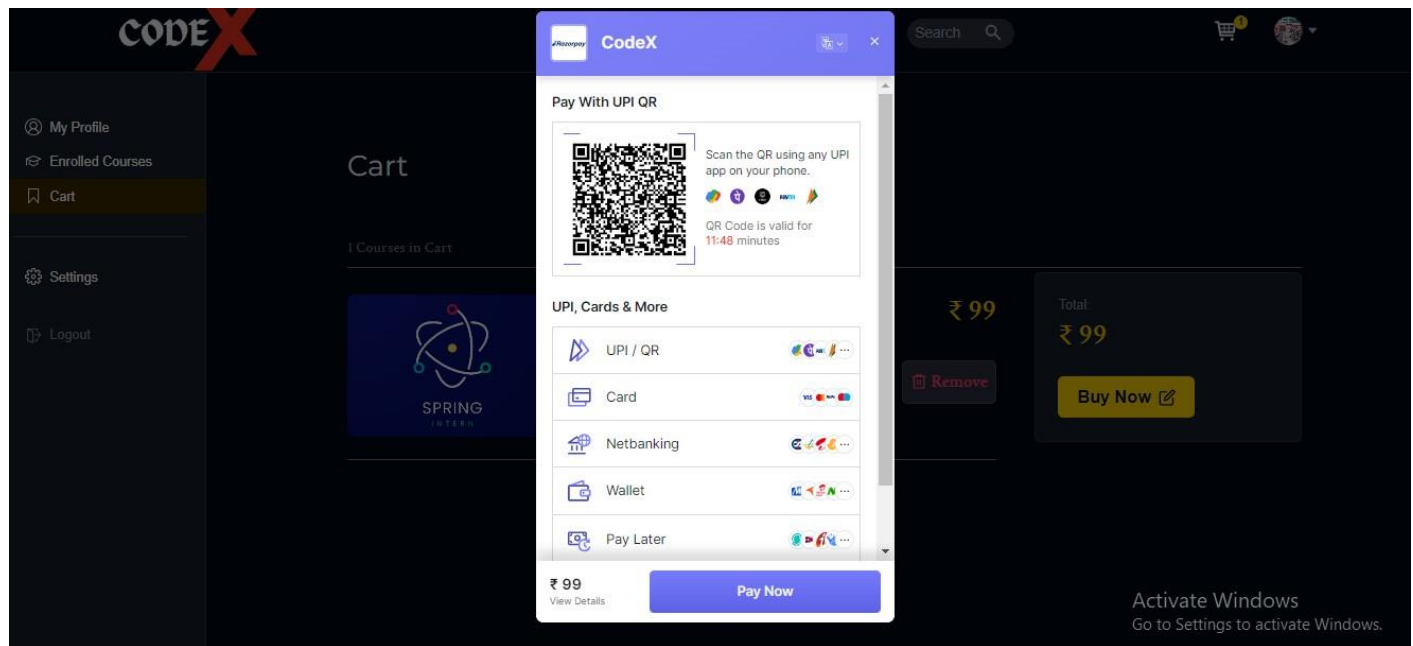


Fig 7.7 payment page

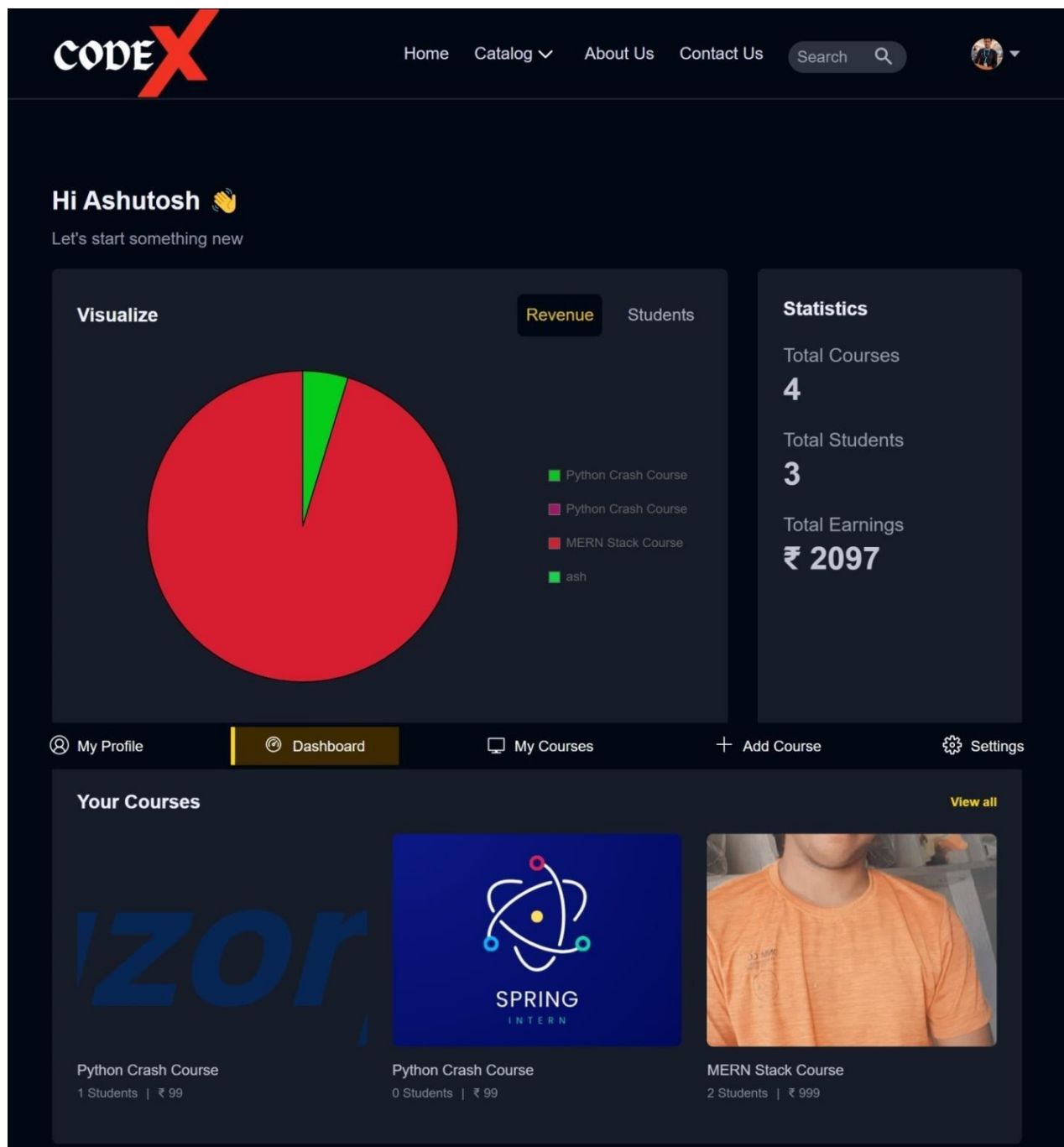


Fig 7.9 Instructor Course Dashboard

[Home](#)
[Catalog](#)
[About Us](#)
[Contact Us](#)

MY Courses

Add Course +

COURSES	PRICE	ACTIONS
<div> <div>Python Crash Course</div> <div>chalo python seekhe</div> <div>Created: December 26, 2023 11:43 AM</div> <div>Published</div> </div>	₹99	
<div> <div>Python Crash Course</div> <div>chalo python seekhe</div> <div>Created: December 26, 2023 0:05 PM</div> <div>Published</div> </div>	₹99	
<div> <div>MERN Stack Course</div> <div>Mern Developer bano</div> <div>Created: December 31, 2023 10:34 PM</div> <div></div> </div>	₹999	

My Profile
 Dashboard
 My Courses
 Add Course
 Settings

<div> <div>ash</div> <div>as</div> <div>Created: February 11, 2024 9:18 AM</div> <div>Drafted</div> </div>	₹34	
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Fig 7.9 Instructor Course Add/Delete

CHAPTER 8

CONCLUSION

In conclusion, the development of the CodeX online learning platform represents a significant step towards revolutionizing programming education. Through meticulous analysis of user needs and behaviors, coupled with innovative design and implementation strategies, CodeX has emerged as a cutting-edge solution for learners seeking to enhance their programming skills.

Throughout the project, we have delved deep into the realm of online learning, recognizing its growing popularity and the myriad benefits it offers to students. By leveraging the power of the internet, CodeX provides transparent pricing, a diverse range of courses, and unparalleled convenience compared to traditional classroom-based learning methods.

Moreover, our exploration of user behavior and preferences has been instrumental in shaping the features and functionalities of CodeX. By understanding the evolving needs of learners, we have crafted an intuitive and user-friendly platform that fosters engagement and facilitates seamless learning experiences. As we navigate the dynamic landscape of programming education, it is clear that online learning platforms like CodeX are poised to play a pivotal role in shaping the future of education. By embracing technological advancements and catering to the needs of modern learners, CodeX stands as a beacon of innovation and excellence in the field of programming education.

In essence, the journey of developing CodeX has been both challenging and rewarding. As we look ahead, we remain committed to further enhancing the platform, expanding its course offerings, and empowering learners worldwide to embark on their programming journey with confidence and competence. With CodeX, the possibilities for learning are limitless, and the future of programming education is brighter than ever before.

CHAPTER 9

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