

# **Project Report On StudyNotion**

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## **CERTIFICATE**

This is to be certified that the project entitled “EdTech Platform” has been submitted for the Bachelor of Computer Science Engineering at Chitkara University, Punjab during the academic semester January 2024- May-2024 is a bonafide piece of project work carried out by “Daksh rana(2210991475),Bhuvan Kumar(2210991448),Devansh Sharma(2210991495), Chirag Mittal(2210991465)” towards the partial fulfillment for the award of the course Integrated Project (CS 203) under the guidance of

**Sign. of Project Guide :**

Ms. Preenu Mittan





## **ACKNOWLEDGEMENT**

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Lastly, We would like to thank the almighty and our parents for their moral support and friends with whom we shared our day-to day experience and received lots of suggestions that improve our quality of work.

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## Table of Contents

### 1. Abstract

### 2. Introduction to the project

#### 2.1 Background

#### 2.2 Problem Statement

### 3. Software and Hardware Requirement Specification

#### 3.1 Methods

#### 3.2 Programming/Working Environment

#### 3.3 Requirements to run the application

### 4. Database

#### 4.1 Database Analysis

#### 4.2 Database Implementation

#### 4.3 Database Design

### 5. Program's Structure Analyzing and GUI Constructing (Project Snapshots)

#### 5.1 Program Structure Analysis

#### 5.2 GUI Construction (Project Snapshots)

#### 5.3 GUI Design Considerations

### 6. Code-Implementation and Database Connections (If any)

### 7. Future Scope

### 8. Conclusion

## 9. Bibliography/Reference

### **1. Abstract**

In an era where technology is reshaping every facet of our lives, education is no exception. **Study Notion** is an innovative EdTech platform designed to address the diverse needs of learners by providing a comprehensive and interactive learning experience. Our platform harnesses the power of artificial intelligence, data analytics, and gamification to create personalized educational pathways that adapt to individual learning styles and paces.

#### **Key Features:**

- 1. Personalized Learning:** Study Notion utilizes adaptive learning algorithms that analyze student performance to tailor content and assessments to their unique needs. This ensures that learners are engaged and challenged at the right level, fostering a deeper understanding of the material.
- 2. Interactive Content:** With a rich library of multimedia resources, including videos, quizzes, and simulations, Study Notion makes learning engaging and interactive. Our platform promotes active participation, allowing students to learn by doing, which enhances retention and comprehension.
- 3. Collaborative Learning:** Understanding the importance of social interaction in education, Study Notion incorporates features that encourage collaboration among peers. Discussion forums, group projects, and peer feedback mechanisms create a community of learners who support and motivate each other.
- 4. Comprehensive Analytics:** Educators and students benefit from robust analytics tools that provide insights into learning progress and outcomes. Teachers can easily track student performance and identify areas for improvement, enabling targeted interventions and support.
- 5. Accessibility and Inclusivity:** At Study Notion, we believe that quality education should be accessible to everyone. Our platform is designed with inclusivity in mind, featuring multilingual support, varied content formats, and customizable learning experiences that cater to diverse learners.

## **2. Introduction**

### **2.1 Background**

The landscape of education has undergone significant transformation in recent years, driven by technological advancements and changing societal needs. Traditional classroom settings often struggle to accommodate diverse learning styles and the varied paces at which students absorb information. This challenge has been exacerbated by the COVID-19 pandemic, which forced educational institutions to rapidly pivot to online learning. As a result, there is an increasing demand for innovative educational solutions that cater to both in-person and remote learners.

Recognizing this gap, **Study Notion** was conceived to provide a flexible and adaptive learning environment that meets the needs of today's students. Our platform draws inspiration from the principles of personalized learning, which emphasize tailoring education to individual strengths and weaknesses. With a focus on enhancing student engagement, promoting collaboration, and improving educational outcomes, Study Notion aims to bridge the divide between technology and pedagogy.

The rise of mobile devices, high-speed internet access, and digital content consumption has created an opportunity to redefine how students interact with educational materials. By leveraging these advancements, Study Notion integrates multimedia content, interactive assessments, and real-time feedback to create a dynamic learning experience. Our goal is to empower learners to take control of their educational journey, fostering self-directed learning and critical thinking skills.

### **2.2 Problem Statement**

Despite significant advancements in educational technology, many learners still face numerous challenges that hinder their academic success and overall engagement with the learning process. Key issues include:

- 1. Lack of Personalization:** Traditional education systems often adopt a one-size-fits-all approach, failing to accommodate the diverse learning styles, paces, and needs of individual students. This results in disengagement and frustration, particularly for those who may require additional support or advanced challenges.
- 2. Limited Access to Quality Resources:** Students in underserved communities frequently lack access to high-quality educational materials and support. This disparity exacerbates the achievement gap, leaving many learners without the tools they need to succeed academically.

3. **Ineffective Feedback Mechanisms:** In many educational settings, feedback is often delayed and not tailored to individual progress. Students may struggle to understand their strengths and weaknesses, hindering their ability to improve and learn effectively.
4. **Challenges in Collaboration:** With the rise of remote and hybrid learning models, fostering collaboration among peers has become increasingly difficult. Many students miss the social interaction and teamwork opportunities provided in traditional classrooms, which are essential for developing critical interpersonal skills.
5. **Lack of Engagement:** Many existing online learning platforms fail to captivate students' attention and maintain their motivation. The absence of interactive and engaging content can lead to boredom, reduced participation, and ultimately lower academic performance.

**Study Notion** aims to address these pressing issues by providing an adaptive, inclusive, and engaging learning platform that meets the unique needs of every learner. By focusing on personalization, accessibility, and collaboration, we seek to empower students to thrive in their educational journeys and develop the skills necessary for future success.

### **3. Software and Hardware Requirement Specification**

#### **3.1 Methods**

The successful implementation and operation of the Study Notion platform rely on a robust set of software and hardware requirements. To ensure a seamless user experience, we will follow a systematic approach in identifying and documenting these specifications. The methods for determining the requirements are as follows:

- **User-Centered Design Approach:**  
Gather insights from potential users through surveys and interviews to identify their needs and preferences.
- **Competitive Analysis:**  
Analyze existing EdTech platforms to understand their features, strengths, and weaknesses.
- **Technical Feasibility Study:**  
Collaborate with developers to determine the technical requirements and suitable technologies for the platform.

- **Agile Development Methodology:**  
Implement an Agile approach for iterative development, allowing for flexibility and responsiveness to user feedback.
- **Performance and Security Assessment:**  
Define performance metrics and security protocols to ensure efficiency and data protection.
- **Documentation and Version Control:**  
Maintain comprehensive documentation and use version control systems to track changes and facilitate collaboration.

## 3.2 Programming/Working Environment

The app is being developed in a full-stack JavaScript environment:

### Frontend

1. **React:**
  - A JavaScript library for building user interfaces.
  - Allows you to create reusable UI components.
  - Provides a virtual DOM for efficient rendering and updates.
2. **Tailwind CSS:**
  - A utility-first CSS framework that enables you to style your components quickly.
  - Encourages a component-based styling approach, making it easy to create responsive designs.

### Backend

1. **Node.js:**
  - A JavaScript runtime that allows you to run JavaScript on the server side.
  - Great for building scalable network applications due to its non-blocking, event-driven architecture.
2. **Express:**
  - A minimal and flexible Node.js web application framework that provides a robust set of features for web and mobile applications.
  - Makes it easier to handle routing, middleware, and server-side logic.
3. **MongoDB:**
  - A NoSQL database that stores data in flexible, JSON-like documents.

- Allows for dynamic schemas, making it a good fit for applications with evolving data structures.

### **Development Tools:**

- **Visual Studio Code:** Code editor with extensions for Node.js and web development.
- **Git:** Version control system for managing code changes and collaboration.
- **Postman:** API testing tool for validating the backend services.

## **3.3 Requirements to Run the Application**

To run the Edtech Platform, the following software and hardware requirements are necessary:

### **Software Requirements:**

- **Node.js:** Version 14.x or higher, along with npm (Node Package Manager).
- **Express.js:** Installed via npm as part of the Node.js ecosystem.
- **Browser:** Any modern web browser (Chrome, Firefox, Edge, etc.) to access the dashboards.
- **Database:** A NoSQL database like MongoDB or a relational database like MySQL for storing and managing user data.
- **Operating System:** The application can be run on any OS that supports Node.js, including Windows, Linux, and macOS

## **Hardware Requirements:**

- **Server:** A server with at least 2 GB RAM and 20 GB disk space for hosting the application.
- **Client Machines:** Any standard computer or mobile device with internet access to interact with the web application.
- **Network:** Stable internet connection for accessing and using the application, both for client and server-side interactions.

## **4. Database Analysis, Design, and Implementation**

### **4.1 Database Analysis**

In the context of the Edtech Platform, the database is crucial for managing various data related to students, teachers, clubs, and administrators. The analysis focuses on understanding the types of data, their relationships, and the requirements for future database implementation using MongoDB.

#### **• Data Requirements:**

##### **i. User Data:**

- **Student Information:** User profile data such as name, email, contact details, enrolled courses, learning progress, and performance in quizzes.
- **Teacher Information:** Name, contact details, qualification, courses taught, and student engagement data.

##### **ii. Course Data:**

- **Course Metadata:** Course titles, descriptions, categories, duration, and prerequisites.
- **Course Content:** Lessons, videos, documents, and quiz questions associated with each course.
- **Course Progress Tracking:** Student progress for each course, including completion status, scores, and feedback.

### **iii. Authentication Data:**

- **User Credentials:** Secure storage of email, password (hashed), or OAuth tokens (for Google, GitHub login).
- **Access Levels:** Roles for different types of users (admin, student, teacher) for managing permissions.

### **iv. Transaction Data:**

- **Enrollments:** Records of students enrolling in courses, including timestamps and course fees (if applicable).
- **Payments:** Secure payment processing information, receipts, and transaction logs.

### **v. Feedback and Interaction Data:**

- **Ratings & Reviews:** Feedback on courses, ratings, and written reviews by students.
- **Discussion Boards:** Data from student-teacher interaction on discussion boards and Q&A sections.

### **vi. Analytics Data:**

- **User Engagement:** Data on course access frequency, time spent on lessons, and engagement with quizzes or assignments.
- **Performance Tracking:** Historical performance data for both students and teachers, used for analysis and improvement.

## ● **Data Relationships:**

**User and Course:** Many-to-Many – Users can enroll in multiple courses, and courses can have multiple students.

**Teacher and Course:** One-to-Many – A teacher can create multiple courses, but a course has only one teacher.

**Course and Lesson:** One-to-Many – A course contains multiple lessons, but each lesson belongs to one course.

**Course and Quiz:** One-to-Many – A course can have multiple quizzes, and each quiz belongs to one course.

**Student and Quiz:** Many-to-Many – Students can take multiple quizzes, and quizzes can be taken by many students.

**User and Review:** One-to-Many – A user can leave multiple reviews, but each review is tied to one course.

**Payment and User/Course:** Many-to-One – Payments are tied to a user and a specific course.

## 4.2 Database Design

### 1. Users Table (Students & Teachers)

- Stores information about users, including personal details, roles (student/teacher), and their enrolled or created courses.
- Key Fields: User ID, Name, Email, Password, Role, Enrolled Courses, Created Courses.

### 2. Courses Table

- Contains details of each course, including its title, description, and associated lessons and quizzes.
- Key Fields: Course ID, Title, Description, Category, Lessons, Quizzes, Teacher ID, Enrolled Students.

### 3. Lessons Table

- Holds information on individual lessons that are part of a course.
- Key Fields: Lesson ID, Title, Content, Course ID.

### 4. Quizzes Table

- Stores data about quizzes within a course, including questions and answers.
- Key Fields: Quiz ID, Questions, Answers, Course ID.

### 5. Enrollments Table

- Manages the many-to-many relationship between users (students) and courses they are enrolled in.
- Key Fields: Enrollment ID, User ID, Course ID, Enrollment Date.

### 6. Reviews Table

- Tracks feedback given by students for each course.
- Key Fields: Review ID, User ID, Course ID, Rating, Comment, Date.

### 7. Payments Table

- Handles payment transactions for course enrollments.
- Key Fields: Payment ID, User ID, Course ID, Amount, Payment Date, Transaction Details.

## 4.3 Database Implementation

The implementation details for MongoDB will be addressed in future stages of the project. Key steps include:

- **Courses Collection:** Contains course details, associated lessons, and quizzes.
- **Lessons Collection:** Stores individual lesson content and metadata.
- **Quizzes Collection:** Holds quiz questions, answers, and links to courses.
- **Enrollments Collection:** Tracks many-to-many relationship between students and courses.
- **Reviews Collection:** Manages student feedback for courses.
- **Payments Collection:** Stores transaction data for course enrollments.
- **References via ObjectIDs:** Links between collections using MongoDB ObjectIDs.
- **Embedded Documents:** Embeds related data (like lessons) to improve performance.
- **Indexes:** Optimizes queries by indexing frequently accessed fields like **User ID** and **Course ID**.
- **Data Integrity:** Uses MongoDB's ACID-compliant transactions for critical operations.
- **Users Collection:** Stores student and teacher data, including personal info and course references.

## 5. Program's Structure Analyzing and GUI Constructing

### 5.1 Program Structure Analysis

#### MERN Stack Architecture:

- Utilizes **MongoDB**, **Express**, **React**, and **Node.js** for full-stack development.

#### Frontend (React):

- Built with **React** for dynamic and responsive UI.
- Component-based structure: Reusable components like **CourseCard**, **LessonList**, and **QuizForm**.
- **State Management:** Uses **Redux** for centralized state management across the application.
- **Routing:** Implemented with **React Router** to manage navigation between pages like course listings, user dashboard, and quizzes.

#### Backend (Node.js + Express):

- **Express Framework** for creating RESTful APIs.
- Organized into modular routes like **/users**, **/courses**, and **/enrollments**.
- Handles user authentication, course management, and payments.

## **Database (MongoDB):**

- **MongoDB** stores data as documents in collections such as **Users**, **Courses**, and **Enrollments**.
- Follows a schema-less structure, allowing flexibility for future scalability.

## **API Layer:**

- **RESTful API** connects the frontend and backend, enabling data exchange.
- API endpoints are secured using **JWT** (JSON Web Tokens) for user authentication and role-based access control (student/teacher).

## **Authentication and Authorization:**

- **JWT-based authentication** ensures secure user login.
- **Role-based access control (RBAC)** limits access to specific features based on the user's role (student or teacher).

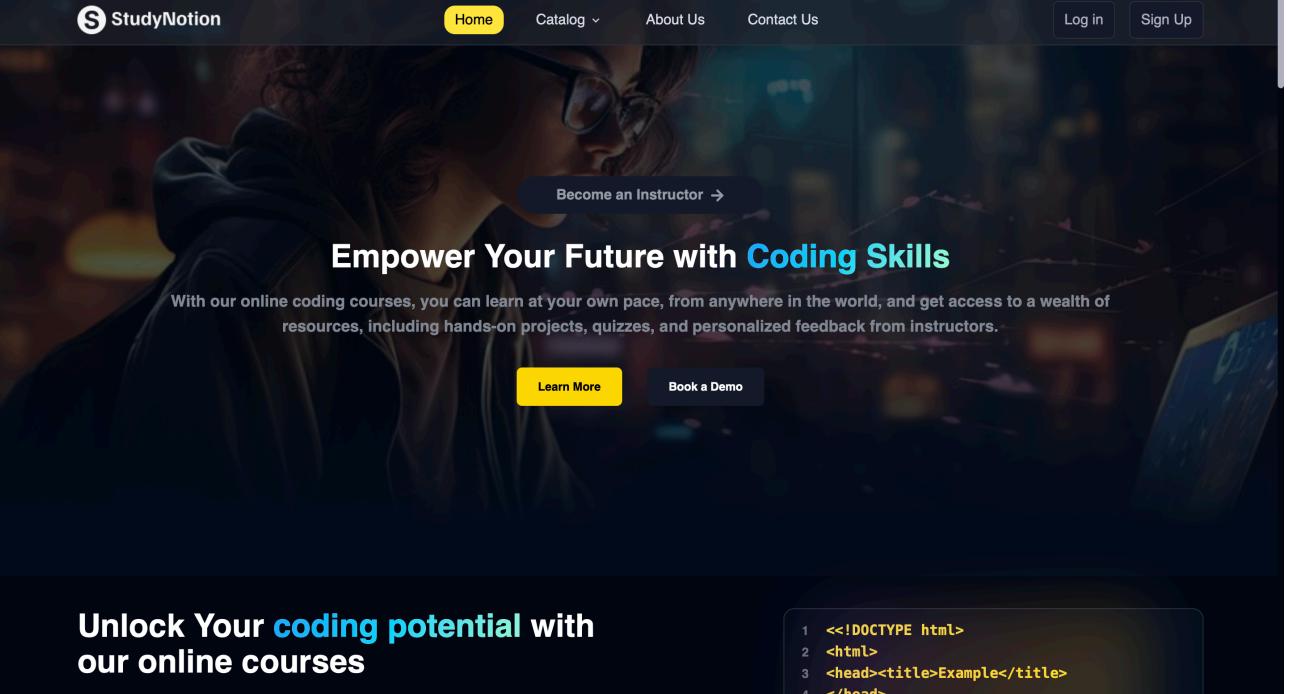
## **Error Handling:**

- Centralized error handling mechanism in Express for catching and managing errors, returning appropriate responses to the client.

## **Development Workflow:**

- **Concurrently** used to run both backend and frontend servers simultaneously during development.
- **Version Control** using **Git** for collaborative coding and managing project versions

## 5.2 GUI Construction (Project Snapshots)



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```

1 <!DOCTYPE html>
2 <html>
3 <head><title>Example</title>
4 </head>
5 <body>
```



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Docs	Docs		Data Analytics	Java	Full Catalog
Projects	Projects		Data Science	JavaScript	Beta Content
Videos	Videos		Data Visualization	Kotlin	
Workspaces	Workspaces		Developer Tools	PHP	
<b>Support</b>			DevOps	Python	
Help Center			Game Development	R	
			IT	Ruby	
			Machine Learning	SQL	
			Math	Swift	
			Mobile Development		
			Web Design		
			Web Development		



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Course Name	Duration	Progress
Full Stack MERN Developer Become a proficient Full Stack MERN Developer with...	1m 12s	Progress: 0%
Android Development Master the art of Android app development! Learn h...	54s	Progress: 14.29%
tp check category tp check category	6s	Progress: 0%
Database Engineer This comprehensive course is designed to equip you...	30s	Progress: 0%
React Native Specialization Master the art of mobile app development with Meta...	30s	Progress: 0%

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**Add Course**

1 Course Information 2 Course Builder 3 Publish

**Course Title \***  
Enter Course Title

**Course Short Description \***  
Enter Description

**Course Price \***

**Course Upload Tips**

- Set the Course Price option or make it free.
- Standard size for the course thumbnail is 1024x576.
- Video section controls the course overview video.
- Course Builder is where you create & organize a course.
- Add Topics in the Course Builder section to create lessons, quizzes, and assignments.
- Information from the Additional Data section shows up on the course single page.
- Make Announcements to notify any important.
- Notes to all enrolled students at once.

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**Visualize**

**Students**   **Income**

Android Development Full Stack MERN Developer IP check category  
Docker In 3 Hours IP check category Database Engineer React Native Specialization

Category	Percentage
Android Development	~25%
Full Stack MERN Developer	~20%
IP check category	~15%
Docker In 3 Hours	~10%
Database Engineer	~10%
React Native Specialization	~10%

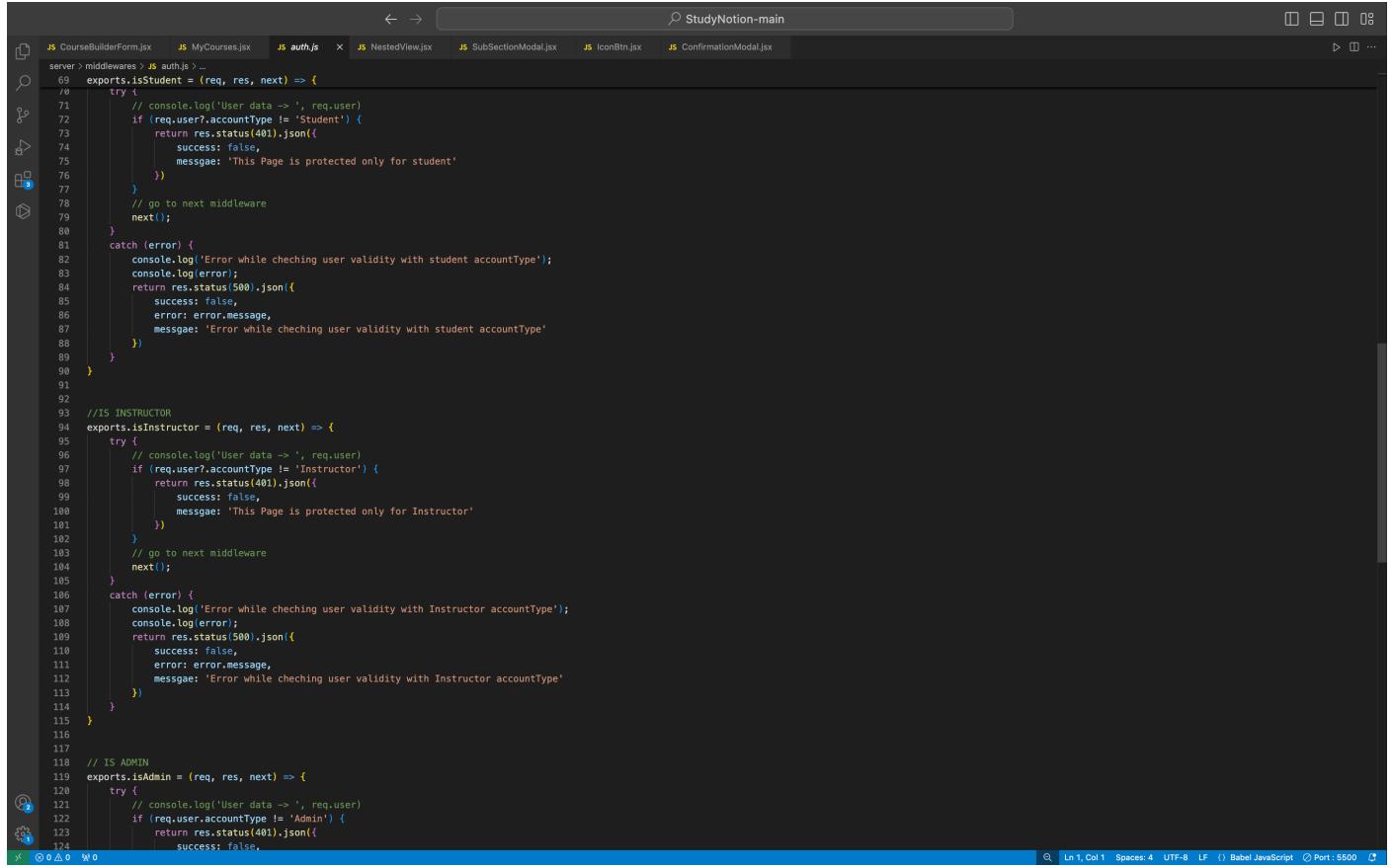
**Statistics**

Total Courses **7**  
Total Students **9**  
Total Income **Rs. 36691**

## 5.3 GUI Design Considerations

- User Experience (UX):** Each dashboard is designed to be intuitive, ensuring that users can easily navigate between sections and perform their tasks efficiently.
- Responsive Design:** The interface is responsive, adapting to various screen sizes to provide a seamless experience on both desktop and mobile devices.
- Consistency:** Uniform design elements and styles are used across different dashboards to maintain consistency and enhance usability.
- Accessibility:** Ensures that the interface is accessible to users with disabilities, adhering to web accessibility standards.

## 6. Code-Implementation and Database Connections (If any)



```

JS CourseBuilderForm.jsx JS MyCourses.jsx JS auth.js X JS NestedView.jsx JS SubSectionModal.jsx JS IconBtn.jsx JS ConfirmationModal.jsx ...
server > middlewares > JS auth.js ...
69 exports.isStudent = (req, res, next) => {
70   try {
71     // console.log('User data ->', req.user)
72     if (req.user.accountType != 'Student') {
73       return res.status(401).json({
74         success: false,
75         message: 'This Page is protected only for student'
76       })
77     }
78     // go to next middleware
79     next();
80   }
81   catch (error) {
82     console.log('Error while checking user validity with student accountType');
83     console.log(error);
84     return res.status(500).json({
85       success: false,
86       error: error.message,
87       message: 'Error while checking user validity with student accountType'
88     })
89   }
90 }
91
92
93 // IS INSTRUCTOR
94 exports.isInstructor = (req, res, next) => {
95   try {
96     // console.log('User data ->', req.user)
97     if (req.user.accountType != 'Instructor') {
98       return res.status(401).json({
99         success: false,
100        message: 'This Page is protected only for Instructor'
101      })
102    }
103    // go to next middleware
104    next();
105  }
106  catch (error) {
107    console.log('Error while checking user validity with Instructor accountType');
108    console.log(error);
109    return res.status(500).json({
110      success: false,
111      error: error.message,
112      message: 'Error While checking user validity with Instructor accountType'
113    })
114  }
115
116
117 // IS ADMIN
118 exports.isAdmin = (req, res, next) => {
119   try {
120     // console.log('User data ->', req.user)
121     if (req.user.accountType != 'Admin') {
122       return res.status(401).json({
123         success: false,
124       })
125     }
126   }
127   catch (error) {
128     console.log('Error while checking user validity with Admin accountType');
129     console.log(error);
130     return res.status(500).json({
131       success: false,
132       error: error.message,
133       message: 'Error While checking user validity with Admin accountType'
134     })
135   }
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server > middlewares > JS auth.js > ...
1 // AUTH , IS STUDENT , IS INSTRUCTOR , IS ADMIN
2
3 const jwt = require("jsonwebtoken");
4 require('dotenv').config();
5
6
7 //AUTH
8 // user Authentication by checking token validating
9 exports.auth = (req, res, next) => {
10   try {
11     // extract token by anyone from this 3 ways
12     const token = req.body.token || req.cookies.token || req.header('Authorization').replace('Bearer ', '');
13
14     // if token is missing
15     if (!token) {
16       return res.status(401).json({
17         success: false,
18         message: 'Token is Missing'
19       });
20     }
21
22     // console.log('Token => ', token);
23     // console.log('From body -> ', req.body?.token);
24     // console.log('from cookies -> ', req.cookies?.token);
25     // console.log('from headers -> ', req.header('Authorization')?.replace('Bearer ', '')); 
26
27     // verify token
28     try {
29       const decode = jwt.verify(token, process.env.JWT_SECRET);
30       // console.log('verified decode token => ', decode);
31
32       // ***** example from console *****
33       // verified decode token => {
34       //   email: 'buydavumli@biyac.com',
35       //   id: '6500d6ae2914831142c702e4c',
36       //   accountType: 'Student',
37       //   iat: 16994542446,
38       //   exp: 1699538846
39       // }
40       req.user = decode;
41     }
42     catch (error) {
43       console.log('Error while decoding token');
44       console.log(error);
45       return res.status(401).json({
46         success: false,
47         error: error.message,
48         message: 'Error while decoding token'
49       })
50     }
51     // go to next middleware
52     next();
53   }
54   catch (error) {
55     console.log('Error while token validating');
56     console.log(error);
57   }
}

```

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```

server > middlewares > JS auth.js > ...
119 exports.isAdmin = (req, res, next) => {
120   // go to next middleware
121   next();
122 }
123
124 catch (error) {
125   console.log('Error while checking user validity with Admin accountType');
126   console.log(error);
127   return res.status(500).json({
128     success: false,
129     error: error.message,
130     message: 'Error while checking user validity with Admin accountType'
131   })
132 }
133
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## 7. Future Scope

### **Advanced Analytics:**

- Integrate detailed student performance analytics and course engagement reports for teachers to monitor progress and improve course content.

### **AI-Powered Features:**

- Incorporate AI-based personalized course recommendations, automated grading systems, and chatbots for 24/7 student support.

### **Mobile Application:**

- Develop a cross-platform mobile app to expand accessibility, enabling students to learn on-the-go.

### **Gamification:**

- Add features like badges, leaderboards, and certificates to enhance student engagement and motivation.

### **Multilingual Support:**

- Expand the platform to support multiple languages, making it accessible to a global audience.

### **Collaborative Learning:**

- Introduce forums, group projects, and peer-to-peer reviews to foster collaboration and interactive learning.

### **Integration with Third-Party Tools:**

- Integrate with popular learning management systems (LMS) and tools like Google Classroom, Zoom, or Microsoft Teams for enhanced functionality.

### **Cloud-Based Scalability:**

- Migrate to cloud-based infrastructure (e.g., AWS, Azure) for better scalability and performance as the user base grows.

### **Subscription Models:**

- Introduce premium subscription plans for advanced features such as personalized tutoring and exclusive course content.

### **Certifications and Partnerships:**

- Partner with universities and professional organizations to offer accredited certifications upon course completion.

## 7. Conclusion

In conclusion, the envisioned simple EdTech platform strives to create an accessible and user-friendly learning environment. With features like user authentication, course management, content delivery, assessments, and progress tracking, it addresses the core needs of both learners and educators. The inclusion of communication tools and an admin dashboard enhances the platform's interactivity and management capabilities. Focusing on a responsive design and basic security measures ensures a seamless and secure user experience. The provision for user feedback and support, coupled with straightforward reporting, reflects a commitment to continuous improvement and user satisfaction. This comprehensive approach aims to lay the foundation for a versatile EdTech platform, balancing simplicity with the potential for future enhancements and adaptability to evolving educational requirements. Moreover, the platform's emphasis on responsive design acknowledges the diverse devices users may utilize, promoting accessibility and flexibility. The incorporation of basic security measures, including secure authentication and data encryption where applicable, underscores a commitment to safeguarding user information. The provision of user feedback mechanisms and a support ticket system fosters a collaborative and responsive user-community dynamic, allowing for iterative improvements based on user input. The inclusion of simple reporting features aligns with a data-driven approach, offering insights into user engagement and course effectiveness. Overall, this holistic approach seeks to provide a foundational yet adaptable EdTech solution that caters to the immediate needs of users while allowing for scalability and evolution in response to emerging educational trends and user preferences.

## 9. References

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