

## Online Classroom System with Course Management Assignment Grading and Attendance Tracking

Polu Rasagna, T. Srilekha\*

Vaagdevi Engineering College, Warangal, 506005, Telangana, India.

\*Correspondence: T. Srilekha

### ABSTRACT

The research presents a full-stack web-based Online Classroom Management System (OCMS) developed to automate and digitalize academic classroom activities through a centralized, secure, and efficient platform. The proposed system addresses challenges associated with traditional classroom management, including manual record keeping, delayed communication, inefficient assignment handling, and limited transparency in attendance and academic evaluation. The application is developed using React JavaScript (React JS) to provide a responsive, interactive, and component-based user interface with Role-Based Access Control (RBAC) for administrators and students. Communication between the frontend and backend is achieved using Axios and Representational State Transfer Application Programming Interfaces (REST APIs). The backend is implemented using the Django Representational State Transfer (REST) Framework, which manages user authentication, authorization, business logic, and data processing. My Structured Query Language (MySQL) serves as the relational database for secure and reliable storage of user information, course details, attendance records, assignments, and grades. The platform incorporates an administrator-controlled user approval mechanism to ensure secure access and authenticated participation. Administrators can create courses, upload assignment Portable Document Format (PDF) files, record attendance, evaluate submissions, and assign grades with feedback, while students can enroll in courses, download assignments, upload PDF solutions,

and monitor their academic progress through personalized dashboards. The proposed system enhances teaching and learning by automating routine academic processes, reducing administrative workload, improving data accuracy, and ensuring transparency, scalability, and efficient academic management for modern educational institutions.

**Key words:** Role-Based Access Control (RBAC), React JavaScript (React JS), Django Representational State Transfer (REST) Framework, Representational State Transfer Application Programming Interface (REST API).

### 1. INTRODUCTION

The topic of online education has gained much attention especially in the last two years (2020–2022) because educational institutions have had to move their courses online due to the COVID-19 pandemic. Professors, students, and managers in these institutions were not asked whether they want to do it; they were required in order to prevent the spread of the virus within the community. Online education offered the opportunity of flexibility in a time when professors and students could not meet face to face [1]. Black et al. [2] considered “online education as an opportunity equalizer”, offering access even to those in less-developed regions, of course, with the condition of having the necessary technical infrastructure (internet connection, devices for connecting online). Other recent studies have presented both challenges and opportunities provided by online education [3,4]. Watermeier et al. [4] mention a “digital disruption” in UK universities determined by moving traditional education abruptly to an

online format. As Adedoyin and Soykan [3] state, challenges should be “transformed to opportunities” for increased quality and efficiency.



Fig. 1: Online classroom system.

As Nickel Teymur and Fardin [5] put it, “education can be divided into before and after the COVID-19 outbreak”, emphasizing the important role of online education during a very challenging time. Our research was not intended to reflect the challenges of the pandemic, which definitely affected education, professors and students, and was instead focused on online education more generally. Online education in Romania during the COVID-19 pandemic was possible because the country declared a state of emergency. Thus, between March 2020 and March 2022, online education was implemented in all higher education institutions. Nonetheless, after the sudden end of the state of emergency in March 2022, many universities faced a lack of legislation that did not allow them to continue with online classes. This was difficult, especially because students were not provided with sufficient time before these changes were announced.

## 2. LITERATURE SURVEY

Potra et al. [6] conducted research on students in the first year of their studies, and among the problems revealed were: “information overload, limited interaction, teacher-related hindrances

and presence and concentration hurdles”. Another report reveals the conclusions of students from the most important universities in Romania: digital competencies were not a problem, technical difficulties were not significant, access to the internet was not limited, computer performance was good enough, digital resources were available in high proportion, and time was not a problem. Dragomir et al. [7] conclude that both verbal and non-verbal communication are important, and provide solutions to compensate for the situation in which professors and students had traditional classes with face masks on during the covid-19 pandemic. As for the digital skills of professors and their readiness to conduct online classes, if this is a problem, it should be followed by important strategies at a national level to better prepare teachers at all educational levels to teach online. Bruggerman et al. [8] highlighted both the positive implications (the flexibility and the opportunities provided) and negative stressors (feeling overwhelmed and pressured to accomplish more tasks, having technical problems, and not being able to extract the essential information from the courses provided online) encountered by students during online classes.

Mheidly et al. [9] mostly highlighted the mental problems determined by spending more time online, mentioning stress, anxiety, and even burnout. Benila pearl and araneid conducted research before the pandemic, comparing the concentration capacity of students in online vs. Traditional formats. The authors noticed that students familiar with online classes were able to focus more due to the technological opportunities that were used by professors to maintain their focus. O’Brien et al. [10], the use of the internet is important for the development of a good education. However, they state that university managers should take into account “the balance

between education... and distraction". Other works mention the risk of online distractions (students using their smartphones to connect on social media or playing mobile games), even for traditional classrooms. Thus, the stress determined by multitasking (listening to a lecture, online or not, while engaging in an unrelated activity) and the lack of concentration due to digital technologies can be attributed to the age they live in, and not only to online education. Muthuprasad et al. [11] showed that internet connection problems in terms of coverage, speed, and limited data were the three most important problems faced by students in India during online classes. Not having a device was only in the sixth position. Sifat conducted research on students in Bangladesh, highlighting technical problems (poor internet speeds, high associated costs) and the stress caused by online classes.

Cullinan et al. [12] addressed the problem of disparities between students with access to the internet and students from regions with less coverage, as well as the way these problems affect the quality of education if universities do not provide support for this latter group of students. Bitakou E et al. [13] the outstanding growth in digital technologies has raised higher education teachers' attention towards developing digital competences for effectively fulfilling students' learning requirements and keeping up with the rapidly evolving global education system. Nowadays, higher education teachers can find a plethora of online courses provided by educational organizations, universities, and businesses for reskilling and upskilling. Zhang et al. [14] conducted an online survey of 22,380 middle school students in Jiangsu Province, China, during the COVID-19 pandemic and found that 25.6% of the tested middle school students had depressive symptoms, 26.9% had anxiety symptoms, and 20.6% had a combination of depressive and anxiety symptoms. Perc et al.

[15] used the evolutionary game model to study the interaction of individuals, groups, and social behaviors, and they analyzed the main factors affecting social cooperation and discussed the relationship between culture and individual cognition and individual sexual behavior. In a word, evolutionary game theory is widely used to solve problems in all aspects of society and has achieved good results. Therefore, this paper applies evolutionary game theory to the online learning management of primary and secondary school students to provide a reference for students' online learning management during the current COVID-19 pandemic.

### 3. PROPOSED METHODOLOGY

The proposed methodology is a web-based academic platform developed to automate and streamline classroom activities in a digital environment. As shown in fig. 2 the system is designed using a modern full-stack approach, integrating a dynamic frontend with a robust backend to ensure seamless interaction between users and academic data. It provides role-based access that differentiates administrative and student functionalities, allowing efficient management and controlled usage of system resources. The platform supports end-to-end academic workflows, including user registration, course creation, enrollment, assignment distribution, submission handling, attendance recording, and grading. A centralized database architecture ensures consistency, reliability, and secure storage of academic information. File handling mechanisms enable assignment PDFs to be uploaded, downloaded, and evaluated efficiently. By replacing manual processes with automated operations, the system improves accuracy, transparency, and scalability, making it suitable for real-world educational institutions and online learning environments.

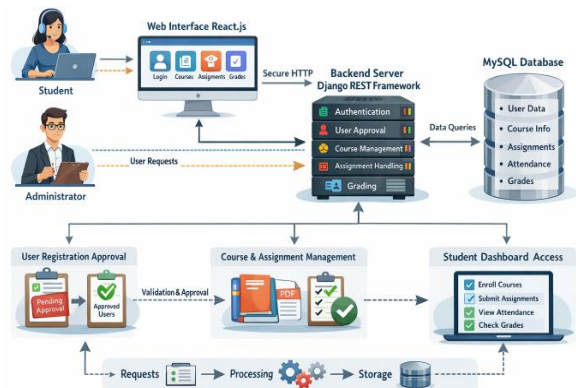


Fig. 2: System architecture of online classroom system.

### User Interface (Web Browser – React.js):

Students and administrators interact with the system through a browser-based interface developed using React.js. The interface enables smooth navigation for user registration, login, dashboard access, course enrollment, assignment submission, attendance viewing, and grade tracking. User actions are converted into secure Hypertext Transfer Protocol (HTTP) requests using Axios and transmitted to the backend server.

### Backend Server (Django REST Framework):

The Django REST backend processes all incoming requests from the frontend and executes the core business logic of the system. It manages authentication, role verification, admin-controlled user approvals, course creation, assignment handling, attendance marking, and grading operations. This layer ensures secure and controlled communication between users and the database using RESTful APIs.

**Database Layer (MySQL):** The MySQL database stores all academic and user-related information in a structured relational format. It maintains user profiles, approval status, roles, course details, enrollments, assignments, attendance records, submissions, and grades. Well-defined schema and efficient SQL queries ensure data consistency, integrity, and reliable retrieval.

**User Registration and Approval Flow:** New users submit registration details through the frontend, which are validated and stored in the database with a pending approval status. This prevents unauthorized access to the system. Administrators review and approve valid users before granting access to academic features.

### Administrator Management Module:

Administrators manage academic operations through secure dashboards. They approve user registrations, create and manage courses, upload assignment PDFs, mark attendance, review submissions, and assign grades with feedback. This ensures accurate academic control and reliable data management.

### Student Access and Learning Module:

Approved students can log in to the system and access their personalized dashboards. They can enroll in courses, download assignments, submit PDF responses, view attendance records, and track grades. This provides transparency and continuous monitoring of academic progress.

### End-to-End Operational Flow:

The system follows a structured workflow from the React-based user interface to the Django backend and MySQL database. Each request undergoes authentication, validation, processing, and secure storage. Role-based access control ensures system reliability, data security, and efficient academic management.

### Workflow

The workflow of this defines the step-by-step operational process that connects users, system modules, and data handling mechanisms in a structured manner. As shown as fig. 3 It begins with user interaction through the web-based interface, followed by request validation and processing at the backend server. Role-based access ensures that administrators and students follow separate but controlled execution paths. Each operation such as registration, approval, course management, assignment handling,

attendance marking, and grading is processed securely through the backend before being stored in the database. The workflow emphasizes automation, data consistency, and real-time accessibility. This systematic flow ensures reliable academic management and smooth coordination between all system components.

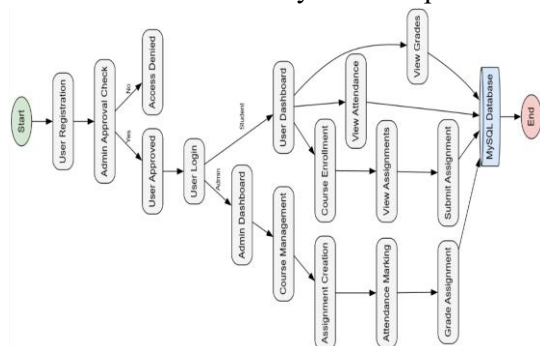


Fig. 3: Workflow of online classroom system.

**User Access and Interface Interaction:** The workflow begins when a student or administrator accesses the system through a web browser using a React.js-based interface. The interface provides options such as user registration, login, course navigation, and dashboard access. Dynamic rendering ensures smooth user interaction without page reloads. Each user action, including form submission and navigation events, is converted into secure HTTP requests using Axios and forwarded to the backend server for processing.

**User Registration Process:** New users submit personal details such as username, email address, mobile number, password, and address through the registration module. The backend validates the submitted data and stores it in the MySQL database with a pending approval status. This mechanism prevents unauthorized access to the system. Users are notified that account activation depends on administrator approval.

**Administrator Approval Workflow:** The administrator logs into the system and views the list of registered students awaiting approval. User details are verified to ensure authenticity and

correctness. Once approved, the user's status is updated in the database, enabling access to system features. This workflow ensures controlled and secure access to the platform.

**Login and Role Validation:** Approved users log in using valid credentials through the login interface. The backend authenticates the credentials and determines the user role as administrator or student. Based on the validated role, the system redirects users to the respective dashboards. Unapproved or invalid login attempts are restricted to maintain system security.

**Academic Management by Administrator:** The administrator manages academic activities through a secured dashboard. This includes creating and managing courses, uploading assignment PDFs, marking student attendance, reviewing assignment submissions, and assigning grades with feedback. All actions are processed through backend APIs and stored securely in the database.

**Student Academic Interaction Workflow:** Approved students access their dashboards to enroll in courses, download assignments, submit assignment PDFs, and monitor attendance records. Students can also view grades and feedback assigned by the administrator. This workflow ensures transparency and continuous monitoring of academic progress.

**Data Storage and Processing:** All user details, course information, assignments, attendance records, submissions, and grades are stored in the MySQL database. Backend APIs handle efficient data retrieval and updates. Data consistency and integrity are maintained across all academic operations.

**End-to-End System Synchronization:** The complete workflow operates through Django REST APIs, ensuring secure validation and data handling. The React frontend dynamically updates content based on backend responses.

Continuous synchronization between the interface, server, and database ensures reliability, scalability, and smooth academic management.

#### 4. RESULTS AND DISCUSSION

The implementation of this research involves integrating a React.js-based frontend with a Django REST Framework backend and a MySQL database. The system is designed to support secure, role-based access for administrators and students. Frontend components handle user interaction, while backend APIs manage business logic and data validation. Academic workflows such as registration, approval, course management, assignment handling, attendance tracking, and grading are executed through structured API calls. File upload mechanisms enable secure handling of assignment PDFs. This implementation ensures reliable data processing, scalability, and smooth user experience.



Fig. 4: Admin add course page.

Fig. 4 represents the course management interface of the Online Classroom System for administrators. It provides a simple form to enter course title and description for creating new courses. Administrators can add academic courses that become available for student enrollment. This module supports structured organization and effective management of academic offerings.



Fig. 5: Admin add assignment page.

Fig. 5 represents the assignment creation interface of the Online Classroom System for administrators. It allows the administrator to select a course and enter assignment details such as title, description, and submission deadline. The interface also supports uploading assignment documents in PDF format through a file upload option. Once submitted, the assignment is securely stored and linked to the selected course. This page enables structured assignment distribution and effective academic management.



Fig. 6: Admin add attendance page.

Fig. 6 represents the attendance management interface of the Online Classroom System for administrators. It allows the administrator to select a course, choose the date, and mark attendance for individual students. Attendance status options such as Present or Absent ensure accurate daily tracking. The system enforces a one-time attendance entry per day to avoid duplicate records. This module ensures systematic monitoring of student participation.

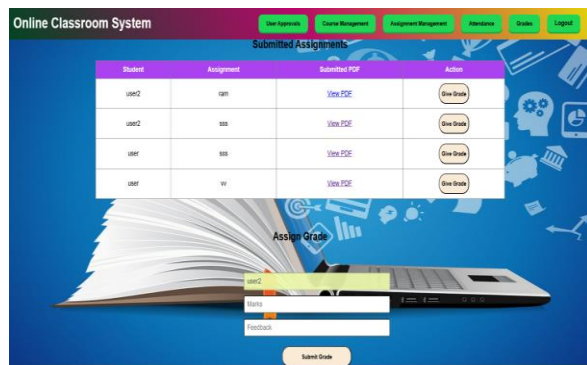


Fig. 7: Admin assign grade page.

Fig. 7 represents the assignment evaluation and grading interface of the Online Classroom System for administrators. It displays a list of submitted assignments along with student names, assignment titles, and links to view submitted PDF files. The administrator can review each submission before assigning marks and feedback. The grading form allows secure entry and submission of evaluation results. This page ensures transparent and structured assessment of student assignments.

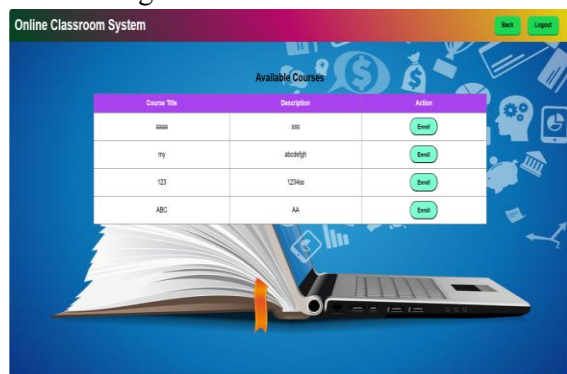


Fig. 8: Student enroll courses page.

Fig. 8 represents the course enrollment interface of the Online Classroom System for students. It displays a list of all available courses along with their descriptions in a tabular format. Students can easily review course details before making a selection. The Enroll button allows students to register for a chosen course with a single action. This page supports smooth and transparent course enrollment within the system.



Fig. 9: Student assignments page.

Fig. 9 represents the assignment management interface for students in the Online Classroom System. It displays a list of assignments associated with enrolled courses, including titles and submission deadlines. Students can download assignment question PDFs directly from this page. The submission column indicates whether an assignment is pending or already submitted. This page helps students track assignment status and manage timely submissions efficiently.

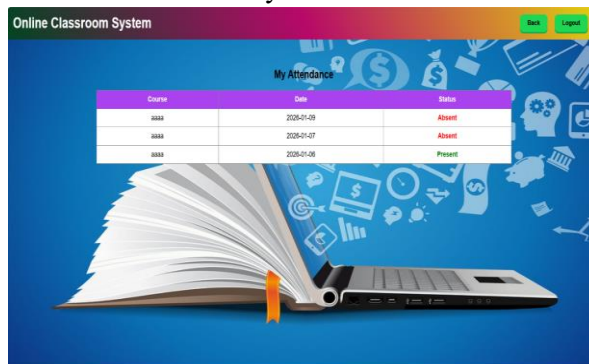


Fig. 10: Student attendance page.

Fig. 10 represents the attendance tracking interface for students in the Online Classroom System. It displays course-wise attendance records along with corresponding dates. Attendance status is clearly highlighted as present or absent for easy understanding. Students can review their participation history across different sessions. This page helps students monitor attendance consistency and academic engagement.



| Assignment | Marks | Feedback |
|------------|-------|----------|
| 10         | 75    | 0        |
| 10         | 80    | 0        |

Fig. 11: Student grades page.

Fig. 11 represents the grade viewing interface for students in the Online Classroom System. It displays assignment-wise marks along with corresponding feedback provided by the instructor. Students can clearly track their academic performance in each assignment. The structured tabular layout ensures easy reading and comparison of results. This page supports transparent evaluation and continuous academic improvement.

## 5. CONCLUSION AND FUTURE SCOPE

This research successfully demonstrates how modern web technologies can transform traditional academic management into an efficient digital process. By integrating a React.js-based frontend with a Django REST Framework backend and a MySQL database, the system delivers a structured, scalable, and user-friendly learning environment. Performance improvements are achieved through optimized API communication, efficient SQL queries, and reduced manual data handling, resulting in faster response times for login, course loading, and data retrieval. Role-based access control and admin approval workflows enhance system security and ensure controlled participation. Automated handling of assignments, attendance, and grading significantly reduces administrative effort while improving accuracy and consistency. The system improves transparency by allowing students to track attendance and grades in real time. The

implementation enhances operational efficiency, reduces errors, and supports scalable academic management suitable for modern educational institutions. The system can be enhanced by integrating online examination and quiz modules with automated evaluation. Advanced analytics and performance dashboards can be added to analyze student progress and attendance trends. Cloud deployment and mobile application support can further improve accessibility and scalability. Integration of notification systems such as email or SMS alerts can enhance user engagement and communication.

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