University of Mumbai

Learning Management System (LMS)

Submitted in partial fulfillment of requirements

for completion of

Mini-Project

by

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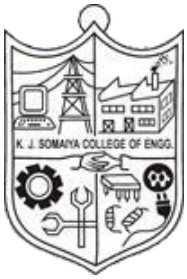

Department of Information Technology
K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

Batch 2021

K. J. Somaiya College of Engineering, Mumbai-77

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Certificate

This is to certify that the report entitled **Learning Management System** is bona fide record of Mini-Project work done by **Kunj Gala, Neelay Jagani, Jai Mehta, Pankti Nanavati** in the semester VI, year 2021 under the guidance of **Prof. Manjitsing Valvi** of Department of Information Technology in partial fulfillment of requirement for the completion of Mini-Project

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Guide Head of the Department

Date: 12-04-2021

Place: Mumbai-77

K. J. Somaiya College of Engineering, Mumbai-77

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Certificate of Approval of Examiners

We certify that this report entitled **Learning Management System** is bona fide record of Mini-Project work done by Kunj Gala, Neelay Jagani, Jai Mehta and Pankti Nanavati.

This project is approved for the award of credits for completing Mini-Project course

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Internal Examiner

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External Examiner

Date: 12-04-2021

Place: Mumbai-77

K. J. Somaiya College of Engineering, Mumbai-77

(Autonomous College Affiliated to University of Mumbai)

DECLARATION

We declare that this written report submission represents the work done based on our and / or others' ideas with adequately cited and referenced the original source. We also declare that we have adhered to all principles of intellectual property, academic honesty and integrity as we have not misinterpreted or fabricated or falsified any idea/data/fact/source/original work/ matter in our submission.

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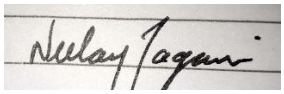
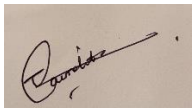
 Signature of the Student 1814021 **Roll No.**	 **Signature of the Student** 1814024 **Roll No.**
 **Signature of the Student** 1814036 **Roll No.**	 **Signature of the Student** 1814045 **Roll No.**

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Dedicated to

Our Family, Friends and Teachers

Abstract

As we entered the situation of Covid 19 we had to switch to an online mode of education. Especially in India, it is a really difficult task to switch to online mode, due to the lack of infrastructure and internet facilities. Besides the lack of facilities, we do not even have a unified online learning system that would manage most of our tasks like online submission of assignments, online examinations, availability of recorded video lectures etc… all under one web application. Thus, this situation inspired us into creating an online learning management system, which would try to facilitate online education, incorporating all the essential features required for the smooth functioning of this mode of education. In this process we faced various challenges in making this mode of education smooth and easy to be understood by all the categories of students and teachers.

A learning management system (LMS) is a software application for the administration, tracking, reporting and delivery of educational content between students and teachers. We decided to name our learning management system "PATHSHALA", since it resembles a school (Pathshala means school in Hindi), the only difference is that it is online. It is an online school. In this application we focus to develop a system that can cater to the needs of teachers by providing them options of making announcements, creating assignments and quizzes or uploading lectures for students to refer to. On the other hand, students will be able to use this system for submitting their assignments, attempting quizzes, viewing or downloading lectures as well as analyzing their performance. This software helps to make the collaboration of teachers and students interactive, easier and accessible outside schools and classrooms.

In this project we have implemented a learning management system with the features mentioned above. We have integrated subjects taught until semester 5 like Python Programming, Database Management System and Advanced Database Management System, Information and Network Security, Web Programming, and Data Structures. It has helped us to get a comprehensive practical experience and gave us a platform to put the skills we have learned into experience into practice.

Table of Contents

List of Figures

List of Tables

CHAPTER 1

Introduction

1.1 Problem Definition

The advancement in technology gives many advantages to the people. All kinds of information can be shared easily by the technology through the Internet. People usually use their computers or gadgets to find every kind of information as fast as possible. This kind of information sharing will lead to the new learning behavior. Nowadays, school students use Internet to find information for their subject's info or learning materials. They also use the Internet to help them finish their assignments. Parents of the school students also need to monitor their children's subjects, learning materials, assignments, and score details. Without all this information, parents cannot help their children to study. The children will have to study for themselves, which sometimes will be hard and confusing without their parent's help. Teachers need to have an interaction with the students outside school hours. This interaction can be an open discussion, information sharing, additional assignments or even lecture videos. Subject's info, main and shared learning materials, assignments, score details, and communication between teachers and students must be delivered as fast as possible. Students and teachers must be notified for all of this information with the real time web environment. This is to ensure that they have the latest information available from everyone involved in the school teaching and learning activities.

1.2 Motivation

Unfortunate crisis getting bestowed upon we during this pandemic, Learning Management System became the need of the hour. Designing a platform that can be accessed by teachers and students providing a means of communication became paramount for sustaining education and

learning. A Learning Management Platform gives the organization the ability to keep track of a learner's progress and ensure that they are meeting their performance milestones. Nevertheless, due to travel restrictions and social distancing instead of having your eLearning content spread out over different hard drives and devices, you can store all of your eLearning materials in one location. This reduces the risk of losing important data and makes it easier to create your eLearning environment. In a country like ours, where internet connectivity and speed seems to be farfetched for people living in the rural, missing opportunities for learning in a live lecture can be compensated by giving the student the means to watch recorded lectures and learn it at their own pace using the platform of Learning Management System. Nevertheless, training and teaching via an LMS reduces employee travel, optimizes training expenditure and usage, and minimizes facilities and instructors to pay. From the cost savings aspect, an LMS is one of the best choices an organization can make. Making the platform so seamless that both students and teachers feel it like a school on a "website".

1.3 Scope of Project

Project Objective

The project, Paathshala is a learning Management System which is designed to help students and teachers to interact with other seamlessly on a unified platform.

Deliverables

I. The ability for Students and Teachers to Sign Up/ Log In.
II. The ability to change profile details and password.
III. Creating and Joining various classroom with unique class codes.
IV. Uploading of lectures in MP4/MKV/M4V Format.
V. Ability to View, Download, adjust volume and scroll through the video lectures.
VI. Creating Assignments.
VII. Creating Quizzes.

VIII. Making Announcements.
IX. Grading Assignments.
X. Displaying the assignment submission progress by displaying pie charts.
XI. Displaying the quiz result performance through bar charts.
XII. Keeping the passwords hashed using MD5 Algorithm for security.

Milestones

I. Designing of Dashboard for Students and Teachers with Proper UI Formatting- 20th February.
II. Designing the backend for displaying the contents of the class for a particular class- 22nd February
III. Creating the backend part for uploading/downloading/seeing videos- 23rd February
IV. Creating the backend for creating assignments, announcements and submissions-26th February.
V. Implementation of creating quizzes- 20th March
VI. Learning and Displaying Graphs for quizzes- 25th March
VII. Creating the Login Sign Up forms with validation- 25th March
VIII. Creation of Sessions and improvising the use of GET Method in PHP -26th March
IX. Encrypting passwords using MD5 Algorithm-31st March
X. Making few tweaks to UI with the help of Bootstrap, CSS and HTML-3rd April
XI. Testing and checking for errors as a whole project- 5th April

Technical Requirements

The web app can only run-on web browsers supporting HTML5.
The maximum size of video to be uploaded is 512MB (Equivalent to 720p Video of 1 Hour)
Server to deploy/ Localhost should have the ability to run python scripts.

1.4 Functional and Non-Functional Requirements

Functional Requirements:

Registration:

Sr. No.	Short Description	Description in Detail
1.	Signup	A new user visiting to 'Paathshala' will be able to sign up as a teacher or as a student. He/she will have to give email id which will be used as a unique primary id for that particular user. The user will have to enter his/her details such as first name, last name, gender, date of birth, member type, password. The password will be hashed and then stored in the database.
2.	Login and Authentication	A user will be able to login to the website by entering his/her email id and password. If the user will enter wrong credentials, then appropriate message will be shown to the user. After a user submits his credentials at the login page the credentials will be collected and validated against user data which is stored on the database. If user is found to be matching, the user will be allowed access to the learning portal. The authentication module will not allow disabled, deleted users and expired users to log on to the

3.	Forgot Password	User will be given an option of forgot password at the login page where he will be able to change his/her password.
4.	Authorization	After the login, each user will be redirected to his dashboard. Teachers will have a different dashboard and students will have a different dashboard. Only Teachers will get an option of create class, create and delete quiz, make and delete announcement, create and delete assignment, upload or delete video lectures, view submissions, grade submissions. Students will not get any of the above-mentioned options. Whereas only students can view the option of submit assignment and view marks.

Table 1: Functional Requirements - Registration

User class Teacher

Sr. No.	Short Description	Description in Detail
1.	Create Class	Teacher will get an option of creating class where unique class code will be auto generated using a python script. The teacher will enter the name for the class and the class will appear on teacher dashboard.
2.	Join Class	Teacher will also be able to join another class created by some other faculty by using a unique class code provided by the creator of the class.
3.	Create Assignment	Inside a class, teacher will be able to create an assignment by inputting assignment title, description, total marks and due date. The due date cannot be set to a date before the creation date of the assignment. Here also the assignment will contain an auto generated unique assignment code for each assignment. The teacher can also reschedule the due date of the assignment.
4.	Delete Assignment	The teacher will be able to delete an assignment by clicking on the delete icon on the class page.
5.	Create Announcement	Teacher will also get an option of creating an announcement wherein he/she can add the details of the announcement and post it.
6.	Delete Announcement	The teacher will be able to delete an announcement by

		clicking on the delete icon on the class page.
7.	Create Quiz	The teacher will get an option of creating a quiz where he/she can enter the quiz title number of questions and number of options for each question. Then he/she can enter each question along with the option, correct answer and marks assigned to that question. She can also set the validity date of the quiz after which students will not be able to attempt the quiz. The teacher can also reschedule the validity date of the quiz.
8.	Delete Quiz	The teacher will be able to delete a quiz by clicking on the delete icon on the class page.
9.	Upload Video Lectures	Teacher will get an option of uploading recordings of the lecture wherein students can view those videos if they have missed any lectures or want to refer it again.
10.	Delete Video Lectures	The teacher will be able to delete a video lecture by clicking on the delete icon on the class page.
11.	View and Grade Submissions	For each assignment that the teacher has posted he/she will get an option of view submission where the teacher can view the assignments submitted by all the students and he/she can even grade those assignments. Also, the status of the submitted assignment will also be visible depending on whether the student have submitted assignment on time or late.
12.	View Profile	The teacher will be able to see their profile by clicking on the profile icon the dashboard. On the profile page he/she will be

		able to see all the details that they filled during the signup process.
13.	Change password	The teacher will also get an option to change password on the profile page itself where he/she can set a new password and it will be updated in the database.
14.	Logout	The teacher can log out of the system by clicking on the logout option on the dashboard.

Table 2: Functional Requirements – User Class Teacher

User class Student

Sr. No.	**Short Description**	**Description in Detail**
1.	Join Class	Student will get an option of join class wherein the student can enter the unique class code provided by the teacher and join a class.
2.	View and attempt quiz	Student will be able to view all the quizzes posted by the teacher and he/she will get an option to attempt that quiz before its validity date. After the end of the quiz, the student will be able to view the marks of the quiz that he/she obtained.
3.	View and submit assignment	Student will be able to view all assignments posted by the teacher of a respective class on the class page. The student will be able to see the total marks assigned to that assignment, additional description if provided by the teacher

		and the due date. Then the student will be able to submit his/her work. The Submission will be marked as 'Turned on time' or 'Turned late' depending on the due date and the submission date.
4.	View announcement	Student will be able to view all the announcements posted by the respective class teacher along the date and time of the creation of announcement.
5.	View or download Video lectures	On the class page, student will be able to view all the lectures uploaded by the respective class teacher. He/she can view those lectures online or they can download it on their respective computer.
6.	View Marks	Students will also get an option of view marks where the students can see the details of all the submissions made by them and the marks assigned to them by the teacher for each submission. This will be displayed in the tabular format.
7.	View Performance	On the class page, students can view their performance in graphical format. A pie chart will be shown displaying the percent of submissions submitted by the student and that not submitted by them. Below the pie chart, student get a bar chart representing their performance in all the quizzes.
8.	View Profile	The student will be able to see their profile by clicking on the profile icon the dashboard. On the profile page he/she will be able to see all the details that they filled during the signup process.

9.	Change password	The student will also get an option to change password on the profile page itself where he/she can set a new password and it will be updated in the database.
10.	Logout	The teacher can log out of the system by clicking on the logout option on the dashboard.

Table 3: Functional Requirements – User Class Student

Non-Functional Requirements:

Usability:

I. The system must be easy to use by both teachers and students such that they do not need to read an extensive number of manuals to use this website.
II. The system must be quickly accessible by both teachers and students.
III. The system must be intuitive and simple in the way it displays all relevant data and relationships.
IV. The features of the system must be easily navigable by the users with buttons that are easy to understand.

Reliability:

I. The System must give accurate status of the updates on each class to the user on the dashboard continuously. Any inaccuracies are taken care of by the regular confirming of the actual levels with the levels displayed in the system.
II. The System must successfully add announcements, quizzes, assignment and lectures as indicated by teacher on the relevant class portal.
III. The system must provide a password enabled login to the user to avoid any foreign entity changing the data in the system.
IV. The system should not update the data in any database for any failed processes.

Availability:

I. The system must be available to the users for a maximum amount of time. So that the users may feel free to visit the 'Paathshala' website anytime they want.
II. Also, the system should require a less amount of maintenance work which will ensure more availability of Learning management system to its users.

Security:

I. Passwords used by each user to login into the system shall be encrypted to avoid any malicious acts.
II. Users shall be required to log in to the Learning Management System for all operations.
III. The system shall permit only 'Paathshala' teachers who are on the list of authorized Teachers to create class and perform operations such as create assignment, announcement, quiz, upload lectures or grade submissions.
IV. The system shall permit only students to submit the assignment inside the classes that they have joined, and view marks obtained for assignments as well as quizzes that they attempted.
V. Each student must be able to see only his marks and shall not be allowed to access marks and details of other students or teachers. But teachers must be able to see the marks of all the students who have joined his/her class.

Performance:

I. The system must not lag, because the users using it don't have down-time to wait for it to complete an action.
II. The system must complete updating the databases, adding the details successfully every time the user requests such a process.

III. All the functions of the system must be available to the user every time the system is turned on.

IV. If for any reason some operation cannot be performed or has failed to execute, then user must be alerted with appropriate messages.

1.5 Organization of the Report

We all elaborated till now all the essential pieces of our system, its scope, functional and non-functional requirements and motivation behind creating this system.

In the follow up part we have discussed the background details regarding the program, things that were going on continuously throughout the course of our project. We discuss about the technologies, programming languages that we have used to create the Web Application. Nonetheless we also discuss about the methodology to our approach, algorithms that we have used to make the Web Application more robust. We have presented the implementation of various web pages and even displayed few test cases regarding the same. We later on discuss about our results and conclude with our learning and describe the scope for future work. We also added few references and acknowledged our Professor without which the project would have not been possible.

CHAPTER 2

Background Work

When the situation of Covid-19 struck the world, it made us realize how important it is for us to have a unified learning management system. The primary purpose of this application is to develop an effortless process of communication between teachers and students. So that, students will have the freedom to study and complete their coursework at their own suitable time. They can remain updated about the important information regarding their courses from the respective teachers via this system. This system will also enable easy access to the materials for students. Also, the quiz section of the system helps student to attempt the quiz and get the results on the spot which increases the engagement of the students. The web application designed by us simplifies the process of creating, distributing, and grading assignments, making announcements, uploading and viewing the lectures and creating and attempting the quiz. By developing such a system, people will get more exposure to an online learning system Also, Teachers and students won't have excessive amounts of paper to shuffle since LMS is completely paperless. Students can access missed work due to absences and locate other resources they may need. With all resources saved in one place and the ability to access LMS anywhere, teachers will have more time to complete other tasks. Since this system can be accessed from a computer, teachers and students can participate through their desktops. In order to make learning meaningful, students can analyze data from assessments and review their performance. By doing this project, we hope to make the collaboration of the teachers and students much easier and interactive outside of schools and colleges.

CHAPTER 3

Implementation

3.1 Technologies Used

HTML:

The **Hyper Text Markup Language,** or HTML is the standard markup language for documents designed to be displayed in a web browser. Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document. HTML elements are the building blocks of HTML pages. With HTML constructs, images and other objects such as interactive forms may be embedded into the rendered page. HTML provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. Our website 'Paathshala' has been developed by html. It is the base of our website. We have used the form tag of html to create all the forms for our website such as signup form, login form, assignment form, announcement form, quiz forms, etc. HTML is basically being the base of our website using which the entire website has been structured.

CSS:

Cascading Style Sheets (**CSS**) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript. CSS is designed to enable the separation of presentation and content, including layout, colors, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file which reduces complexity and repetition in the structural content as well as

enabling the .css file to be cached to improve the page load speed between the pages that share the file and its formatting. We have used CSS for making the website 'Paathshala' more attractive by using different styles, text fonts, colors etc.

BOOTSTRAP:

Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains CSS- and (optionally) JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.

Bootstrap is among the most starred projects on GitHub, with more than 142,000 stars, behind freeCodeCamp (almost 312,000 stars) and marginally behind Vue.js framework. We have used bootstrap extensively to make website look more attractive and responsive. We used containers and columns to structure the forms. We also used bootstrap navbar to make the navbar for our website.

PHP:

PHP is a general-purpose scripting language especially suited to web development. It was originally created by Danish-Canadian programmer Rasmus Leadoff in 1994. The PHP reference implementation is now produced by The PHP Group. PHP originally stood for *Personal Home Page*, but it now stands for the recursive initialism *PHP: Hypertext Preprocessor*.

PHP code is usually processed on a web server by a PHP interpreter implemented as a module, a daemon or as a Common Gateway Interface (CGI) executable. On a web server, the result of the interpreted and executed PHP code – which may be any type of data, such as generated HTML or binary image data – would form the whole or part of an HTTP response

We have used PHP extensively for our backend purposes such as connecting, storing, updating, deleting the data from the database. We have also performed validations of the inputs using PHP.

JAVASCRIPT:

JavaScript often abbreviated as JS, is a programming language that conforms to the ECMAScript specification. JavaScript is high-level, often just-in-time compiled, and multi-paradigm. It has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions. Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web. Over 97% of websites use it client-side for web page behavior, often incorporating third-party libraries. All major web browsers have a dedicated JavaScript engine to execute the code on the user's device. We have used JavaScript for displaying the performance of the students on his dashboard. We have used graphs such as bar graphs for quiz marks and pie charts for assignment submissions.

MYSQL:

MySQL is an open-source relational database management system (RDBMS).

A relational database organizes data into one or more data tables in which data types may be related to each other; these relations help structure the data. SQL is a language programmer use to create, modify and extract data from the relational database, as well as control user access to the database. In addition to relational databases and SQL, an RDBMS like MySQL works with an operating system to implement a relational database in a computer's storage system, manages users, allows for network access and facilitates testing database integrity and creation of backups. We have used MYSQL database for storing all the data. There are total 10 tables that we have created inside a database named ‘Paathshala’. Using these databases all the data is securely stored and retrieved whenever required.

PYTHON:

Python is an interpreted, high-level and general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant indentation. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects. Python is dynamically typed, and garbage collected. It supports multiple paradigms, including structured (particularly, procedural), object-oriented and functional programming. Python is often described as a "batteries included" language due to its comprehensive standard library. In our project we have used python language for randomly generating unique codes. These codes are generated and used whenever a new class, assignment, announcement, quiz, lecture have been created. These unique codes are checked in the database first and if the code is present in the respective table then a new code is generated.

3.2 Methodology

The era of software development is drastically changing at ground-breaking speeds. It is extremely important to keep up with the current trends, technologies and methodologies. A web development team generally selects a process which fits in their personnel and resources.

For the web application created by us, we have decided to choose the Agile Methodology.

This software development methodology is a very flexible method where the web developer works on small chunks of the project. In such a scenario, the client has access to multiple iterations of the project and he reviews the work at each stage. The changes are implemented constantly, and the client gives rapid feedback to the web developer.

This is the lifecycle of the Agile methodology:

1. Understanding project requirement

I. The project is initiated by gathering a part of the information about the project. The initial requirements are identified, prioritized and the necessary resources are selected.

II. An estimate is calculated for the entire work. A demo is created or selected as to how the work will be demonstrated.

III. After this, the next step is sprint planning.

2. Sprint Planning

I. A sprint is nothing but a period during which the task is completed and ready for review.

II. 83% conduct sprint planning prior to each sprint. To make it more target based, we firstly decide the duration of the sprint. The shorter the sprint, the more flexible and frequent the working version becomes. Hence, the feedback for each iteration will be taken on a regular basis. This helps in debugging the bugs and fixing every minor problem on time. The time period for each sprint is decided depending on the amount of features to be added to the project.

3. Designing the product

I. Now the designing of the website begins. The tasks are allocated to the respective developers. Once started, a track is kept on the tasks in the form of a board. The list of tasks moves from “To Do” list to “In Progress”.

II. The basics of agile marketing include speed and scale. Speed means the time taken to fix the problems. It is very important to the right things the right way. This, in turn, gives expertise, continuous delivery, domain knowledge, and faster feedback.

III. When a part of the website is ready, the next phase called “Testing” is done.

4. Testing

The web development team is involved in content and navigation right from the beginning. The web developer entails the small delivery sets as per the requirements. The team gets feedback from the respective developers. The designs are tested simultaneously, and the results are demonstrated immediately.

5. Feedback and preparing for the next set of work

Once the feedback is received at each stage, the results are discussed within the team. How the development process can be improved and what further steps can be taken, becomes the deciding factor for the next set of work.

This methodology focuses on continuous delivery in the world of web development.

Procedure:

I. The user will need to register if he/she has not registered by clicking on ‘Not a member. Sign Up here on login page’.

II. The teacher can sign up by choosing the member type as ‘Teacher’ whereas student can sign up by choosing member type as ‘Student’ in the sign-up form.

III. Once the registration is done, the details are stored in the database, where the password is stored in hashed format to increase the security, and the user is navigated to the login page.

IV. On the login page, user has the option to login or if the user has forgotten the password, he/she can even change the password by clicking on the Forgot Password option.

V. The student or teacher can enter their email id and password on the login page, which is validated against the details in the database.

VI. Teacher on logging in has an option to create class, join class, view profile and logout.

VII. Teacher can create class by clicking on the Create Class option on the Navbar. The modal will be display along with the class code which teacher can share with the students for them to join; also, the teacher will have to enter the class name.

VIII. Once the class is created, it will get displayed on the dashboard. The teacher can create as many classes as he/she wants.

IX. The teacher has options to create assignment, mcq quiz, announcement and upload lectures for each class.

X. For creating quizzes, the teacher has to enter total number of questions, total number of options, questions, options, correct answers and the marks for each question along with the validity date of the quiz.

XI. For creating assignment, the teacher has to fill in the details of assignment like title, description, marks and validity date of the assignment.

XII. For uploading lecture, the teacher has to upload the video file from the personal computer along with the title of the lecture.

XIII. The teacher can create announcements if any by clicking on Make Announcement from top right corner.

XIV. The teacher has an option to reschedule the assignments as well as the quizzes.

XV. The teacher can grade the assignments entered by each student which can be viewed by the students.

XVI. Teachers can delete any of the assignments, quizzes, lectures, announcements from the class.

XVII. The student can join any number of classes by entering the class code shared by the teacher.

XVIII. All the assignments, quizzes, lectures and announcements uploaded by the teacher on each classroom can be accessed by the students enrolled in that classroom.

XIX. The students can attempt the quiz only once before the validity date of the quiz by clicking on Attempt Quiz option.

XX. The student can submit the assignments in any format (. docx, pdf, ipynb, tex, etc.) by clicking on the Submit Assignment option.

XXI. The lecture videos uploaded by the teacher can be viewed as well as downloaded by the students for better understanding of the topic taught.

XXII. The students can check the total number of assignments that have been created, total number of assignments submitted on time and total number of assignments submitted late displayed by the pie chart for each classroom.

XXIII. The students get to view the statistics showing the number of student's vs the percentage obtained for the quizzes of that particular class.

XXIV. The students can view marks for each assignment which have been graded by the teacher from the top right corner of the page 'View Marks' option.

XXV. Lastly, the user can access the profile section by clicking on the Profile Button on the navbar of dashboard, where he/she can view the information using which they had registered during the sign up process and has the option to change the password.

Database Activities:

I. The registration details entered by the user on sign up are stored under the table **USERS**. This table holds user's information about the first name, last name, date of birth, gender, email id (unique), type of member (i.e. teacher or student) and password.

II. When a class is created by the teacher, the details of the created class are stored in the table **CLASSES**. The table classes hold information about the respective classes, having a unique class code (comprised of six characters which can include numbers and small case alphabets), name of the class, the person who has created the class and the date on which the class has been created.

III. Whenever a class is created the details of the members of the class who either create it or join the class using the unique class code are stored in **MEMBERS** table, with designation as member or creator, besides the email id and the class code for the respective class.

IV. In a class teacher has the option to uploaded recorded lectures, which can be viewed by the students for their future reference. The details of these videos will be stored in the database in the **VIDEOS** table. The table uses video id as primary key, besides the attributes like file name, email of the teacher, the date and time of upload, class code as the foreign key and the description about the video.

V. The teacher uploads assignments in a class. The details of the assignments are stored in the **ASSIGNMENT** table. It stores the attributes regarding title, description, marks, due date, email (of the creator), creation date, time, a unique assignment id and class code.

VI. The students can submit the assignments as per their requirement and the details of their submission will be stored in **SUBMISSION** table. This table will have the attributes for the respective assignment id and class id as the foreign keys, email id of the student,

name of the file, the marks graded for the assignment by teacher, a unique id per submission and the status of submission.

VII. The teachers can make announcements on the web page and the details of these announcements will be stored in the **ANNOUNCEMENT** table. The table has the attributes, description, email of the respective teacher, date, time, a unique announcement id and a class as a reference key.

VIII. Lastly, the teacher can create a multiple-choice quiz. The details of the quiz are stored in three different tables:

- **QUIZZES**: in this table, details about the quiz are stored and the table has the quiz code as a primary key. Other information that this table stores is subject for which the quiz is created, the quiz creator email id, number of questions and options for the respective quiz, code of the class for which the quiz has been created, and the date till which the quiz will be valid.

- **QUIZ_QANDA:** table stores the questions, answers and marks for the questions. It has the fields, question, answer 1 to 6. For the questions the answer options can range from two to six, if there are less answers, the rest of the options remain null. In addition, there is a field that stores the value of the correct answer and another field that stores the marks allotted to the question.

- **QUIZ_RESULTS:** table stores the information of the students who attempt the quiz. It stores the email of the student who has attempted the quiz, the quiz code for the respective quiz, total marks, total number of questions, total correct, total incorrect, total unanswered questions, and the score obtained.

Algorithms

1) MD5 Hashing Algorithm for Hashing Password

Message Digest Algorithm 5 (MD5) is a cryptographic hash algorithm that can be used to create a 128-bit string value from an arbitrary length string. Although there have been insecurities identified with MD5, it is still widely used. MD5 is most commonly used to verify the integrity of files. However, it is also used in other security protocols and applications such as SSH, SSL, and IPsec. Some applications strengthen the MD5 algorithm by adding a salt value to the plaintext or by applying the hash function multiple times.

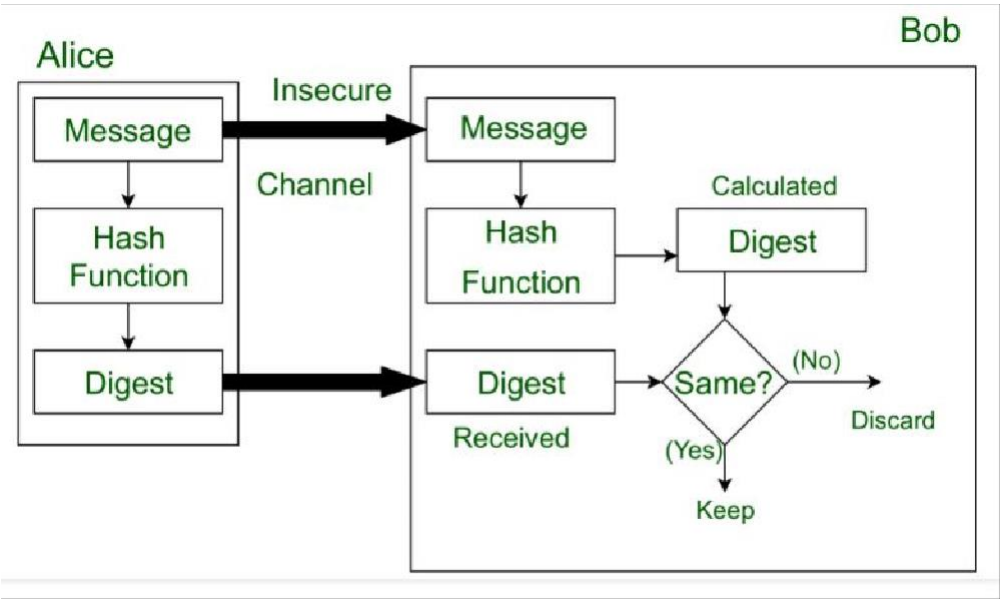


Image 1: MD5 Hashing Outline

Step1: Append Padding Bits

Padding means adding extra bits to the original message. So in MD5 original message is padded such that its length in bits is congruent to 448 modulo 512. Padding is done such that the total bits are 64 less, being a multiple of 512 bits' length.

Padding is done even if the length of the original message is already congruent to 448 modulo 512. In padding bits, the only first bit is 1, and the rest of the bits are 0.

Step 2: Append Length

After padding, 64 bits are inserted at the end, which is used to record the original input length. Modulo 2^64. At this point, the resulting message has a length multiple of 512 bits.

Step 3: Initialize MD buffer.

A four-word buffer (A, B, C, D) is used to compute the values for the message digest. Here A, B, C, D are 32- bit registers and are initialized in the following way

Word A	01	23	45	67
Word B	89	Ab	Cd	Ef
Word C	Fe	Dc	Ba	98
Word D	76	54	32	10

Table 4: Example of Words

Step 4: Processing message in 16-word block

MD5 uses the auxiliary functions, which take the input as three 32-bit numbers and produce 32-bit output. These functions use logical operators like OR, XOR, NOR.

F(X, Y, Z)	XY v not (X)Z
G(X, Y, Z)	XZ v Y not (Z)
H(X, Y, Z)	X xor Y xor Z
I(X, Y, Z)	Y xor (X v not (Z))

Table 5: Example Continued

The content of four buffers are mixed with the input using this auxiliary buffer, and 16 rounds are performed using 16 basic operations.

Output:

After all, rounds have performed, the buffer A, B, C, D contains the MD5 output starting with lower bit A and ending with higher bit D.

2) File Sort in MySQL

In MySQL, file sort is the catch-all algorithm for producing sorted results for ORDER-BY or GROUP-BY queries.

MySQL has two algorithms for file sort, the original and the modified algorithms.

The most commonly used algorithm is the so-called modified algorithm, it is used for all cases except when BLOB and TEXT column are involved.

Read the rows that match the WHERE clause.

I. For each row, record a tuple of values consisting of the sort key value and the additional fields referenced by the query.

II. When the sort buffer becomes full, sort the tuples by sort key value in memory and write it to a temporary file.

III. After merge-sorting the temporary file, retrieve the rows in sorted order, read the required columns directly from the sorted tuples

IV. The size of the sort buffer is controlled by the system variable sort_buffer_size. The more tuples we can pack into the sort buffer; the faster file sort will execute.

3.3 Implementation

SIGNUP FORM:

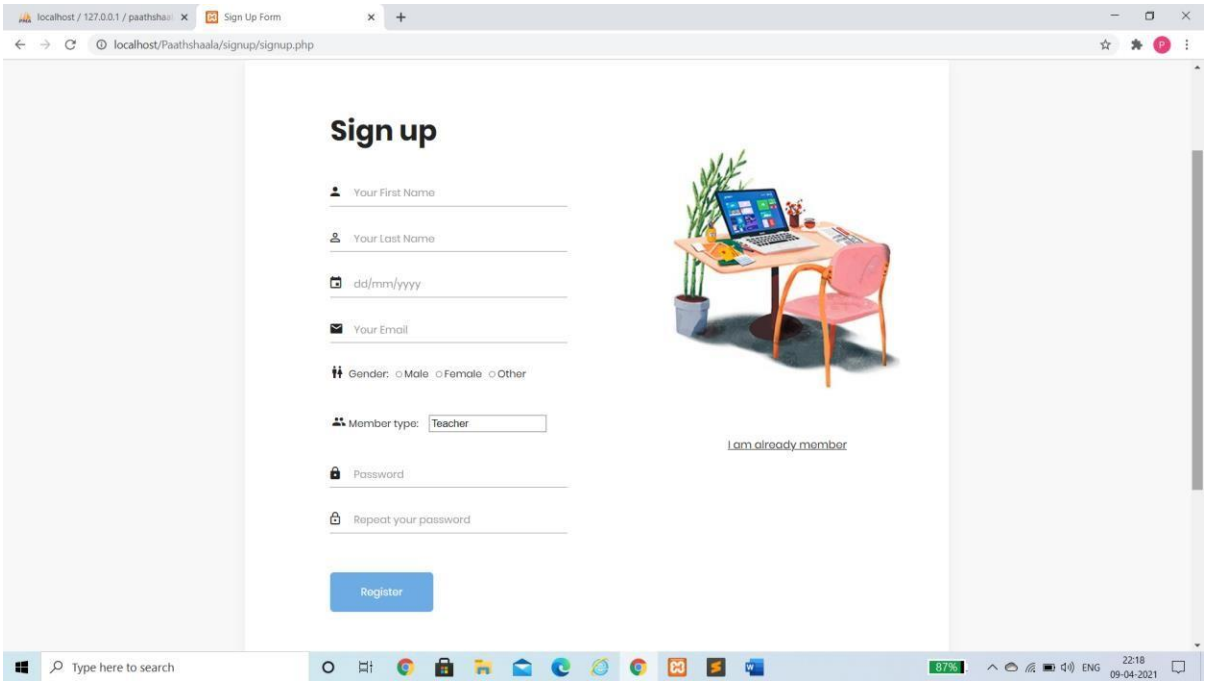


Image 2: Signup Form

TEST CASES:

All fields are marked as required:

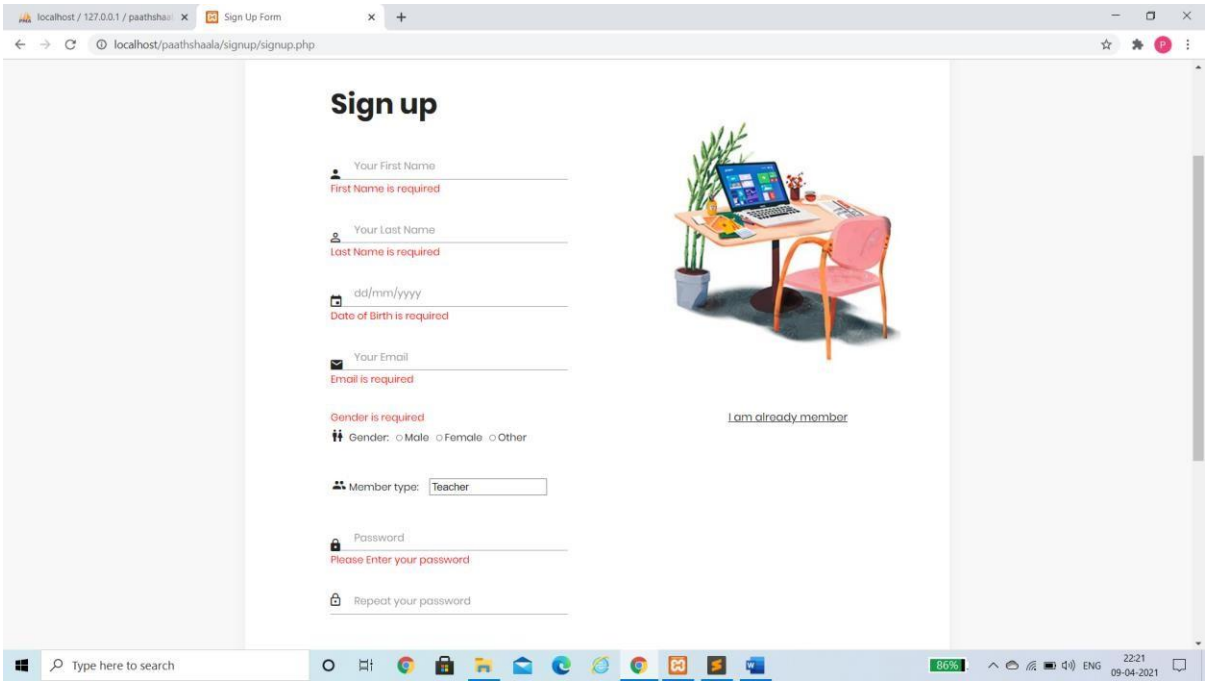


Image 3: All fields are required

Entering invalid first name, last name, date, email address and password containing less characters and miss match passwords:

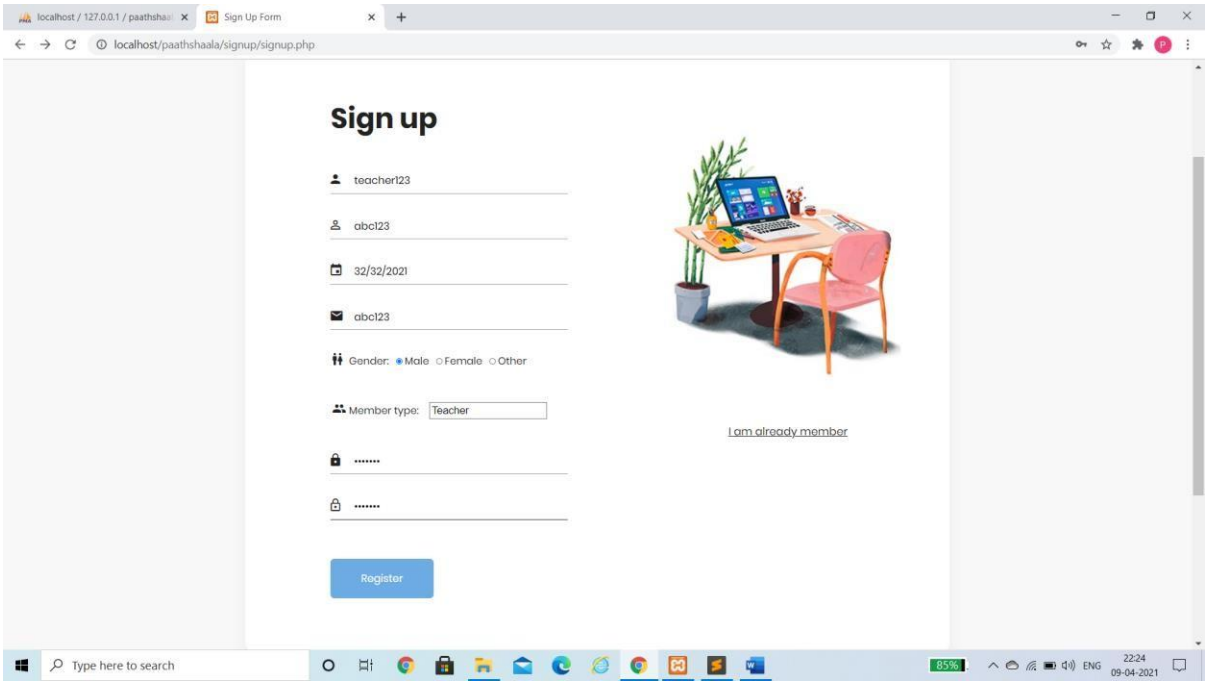


Image 4: invalid details

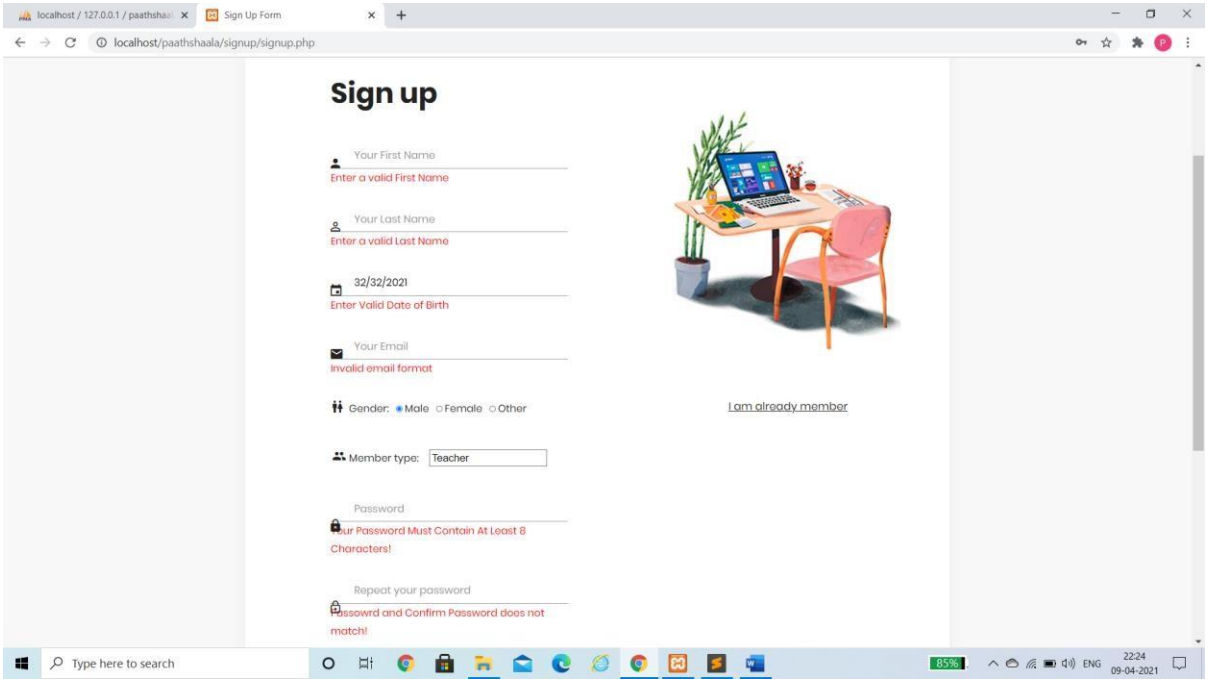


Image 5: Error messages for invalid details

Password should contain at least 1 number:

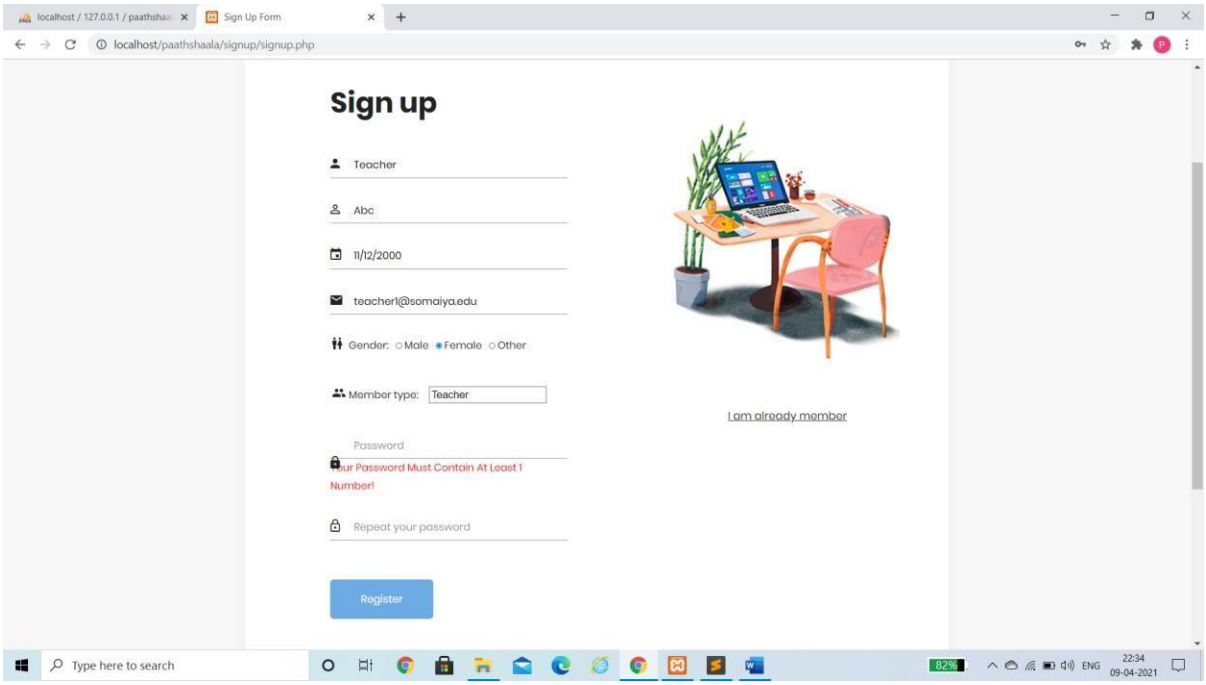


Image 5: Password should contain at least 1 number

Password should contain at least 1 Uppercase letter:

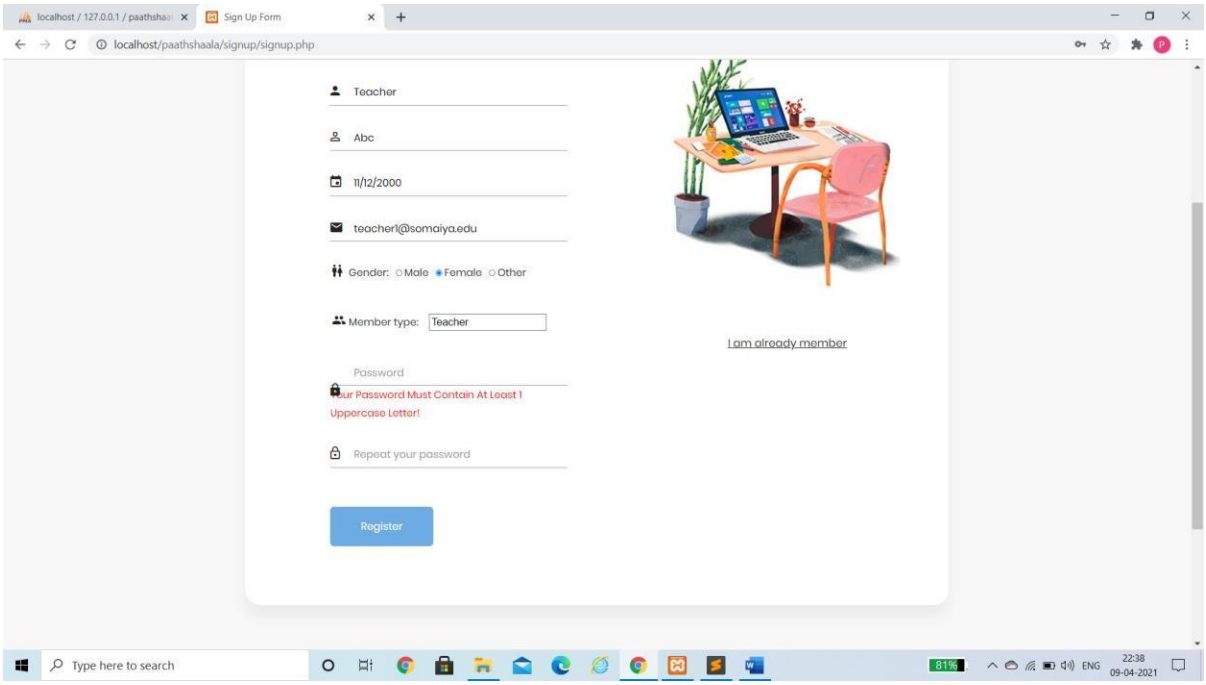


Image 6: Password should contain at least 1 Uppercase letter

Correct credentials with same password ‘Teacher@1’

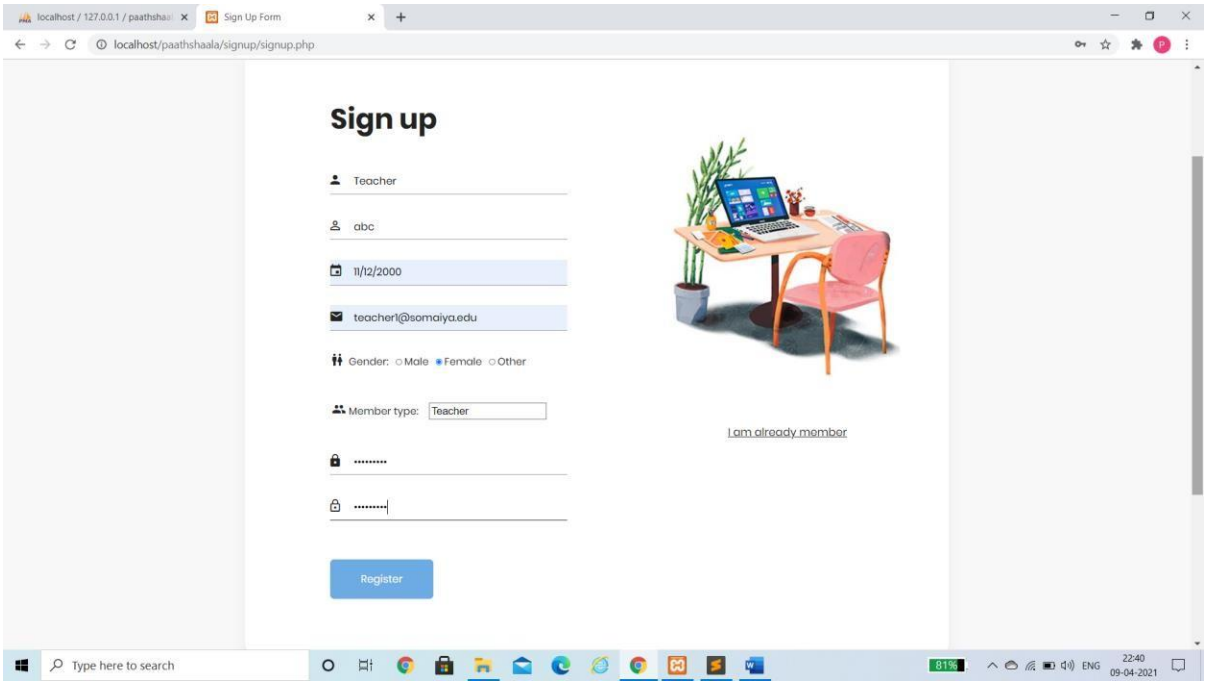


Image 7: Correct Credentials

LOGIN FORM:

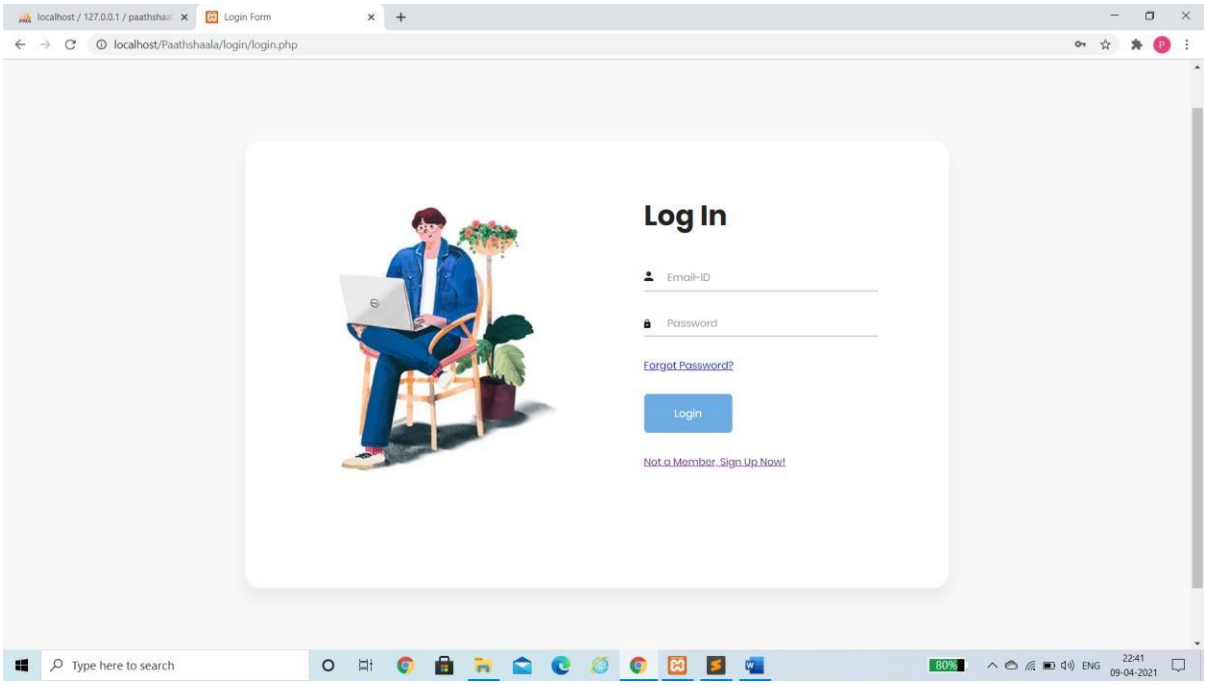


Image 8: Login Form

TEST CASE:

Both fields-email and password are required

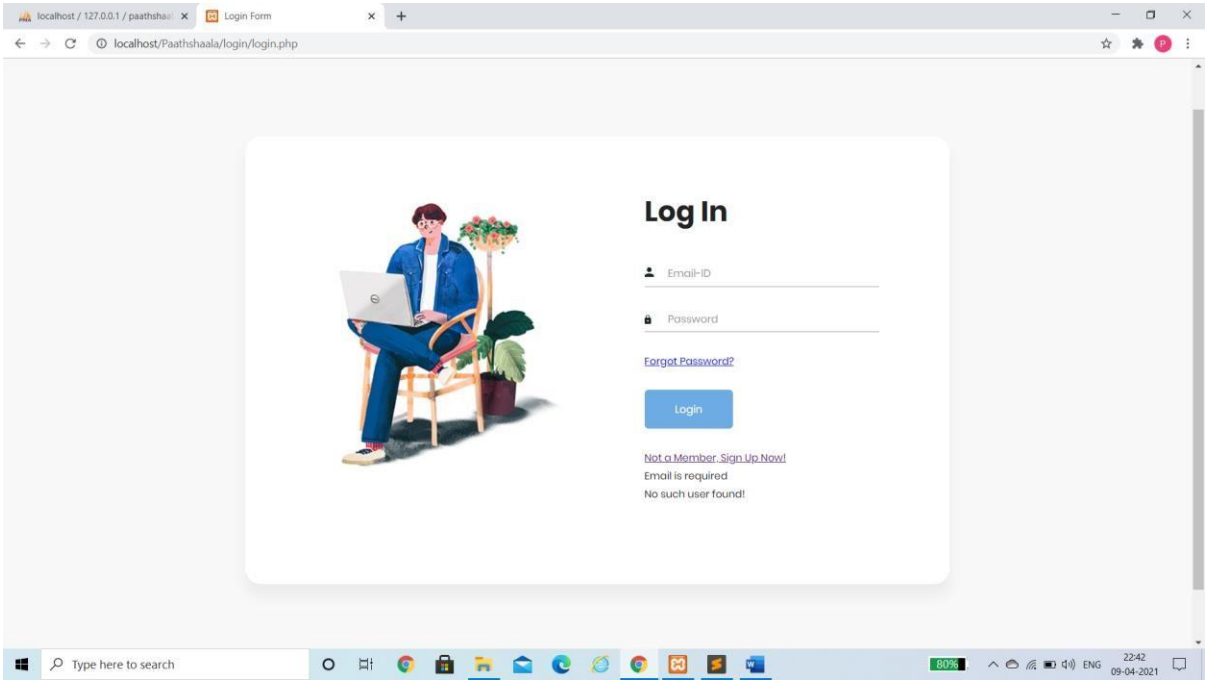


Image 9: email and password are required

Entering wrong email id ‘teacher123@somaiya.edu’. Output = No such user found

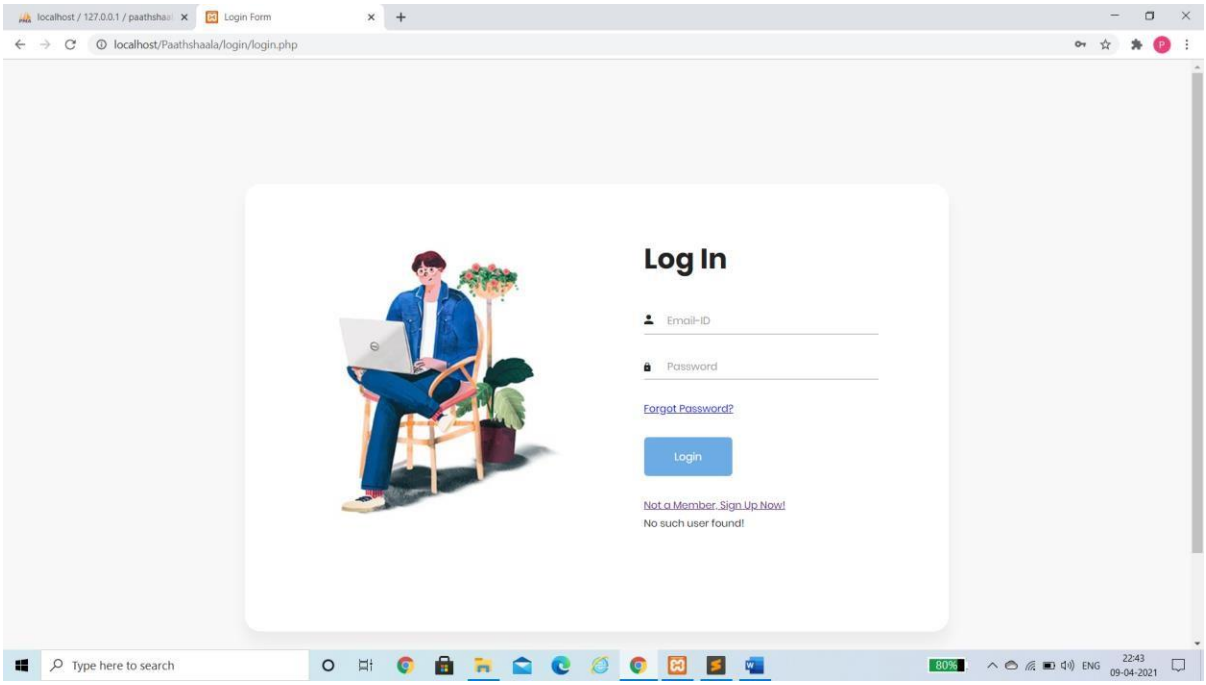


Image 10: Not a registered user

Entering wrong password ‘Teacher’

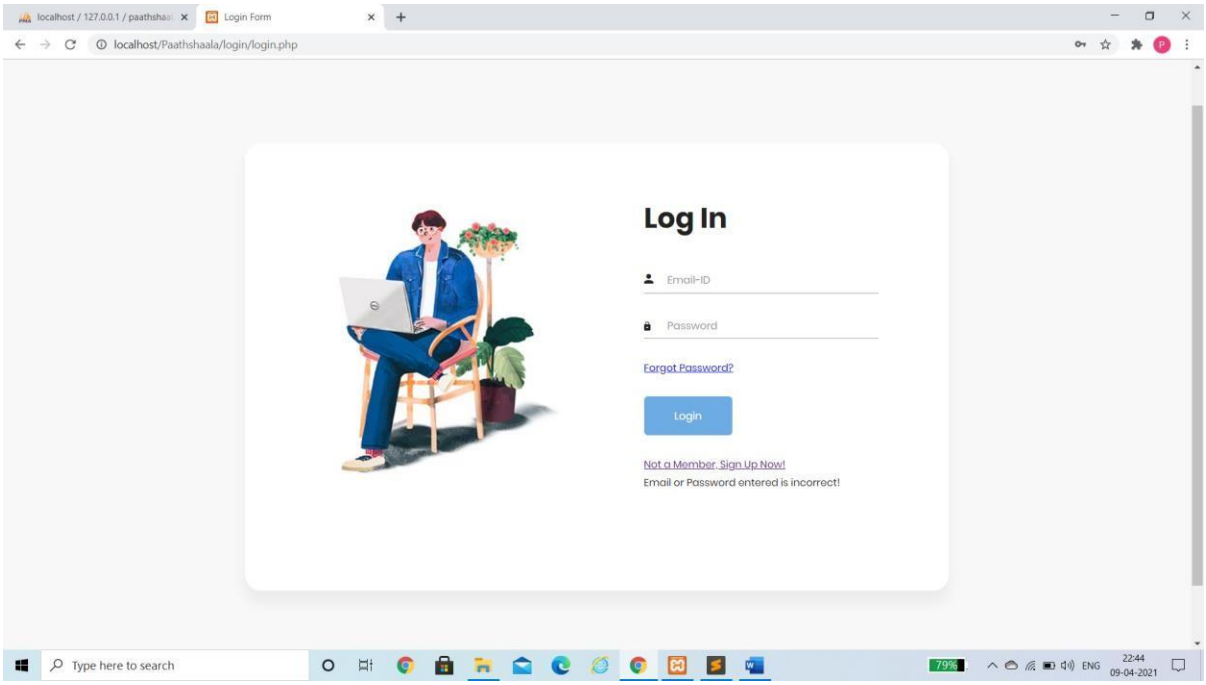


Image 11: Wrong Password

Entering correct credentials

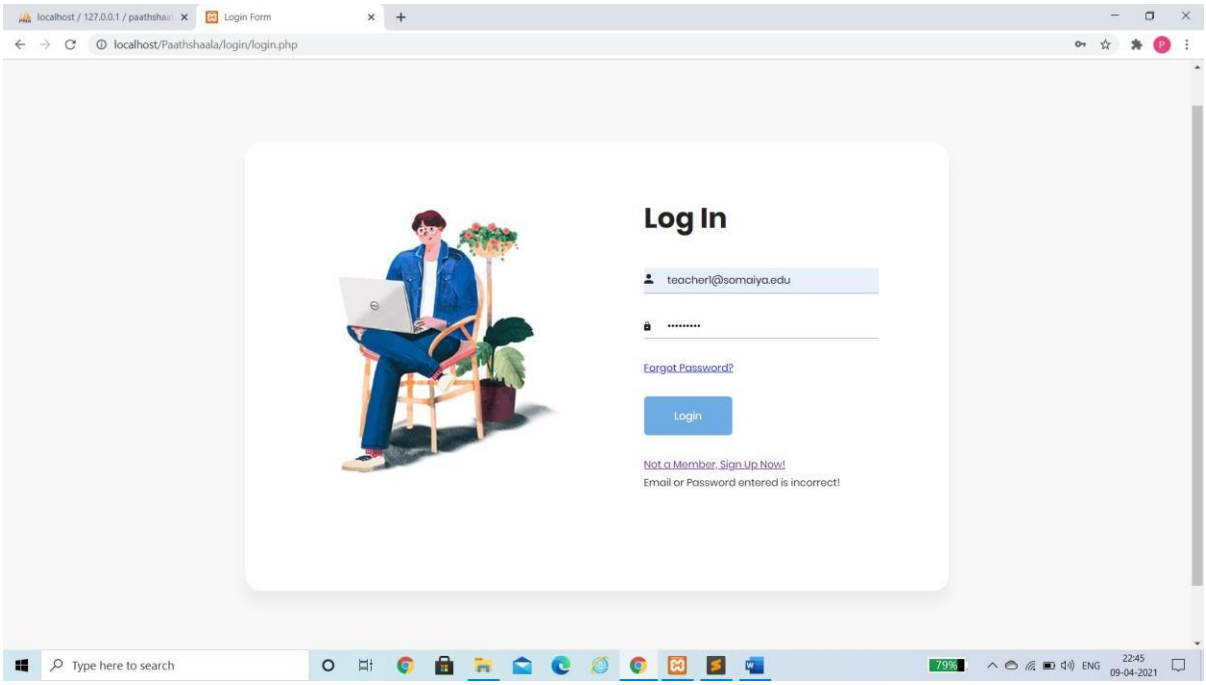


Image 12: Entering Correct Credentials

TEACHER DASHBOARD:

Initially, no classes or created or joined by the teacher

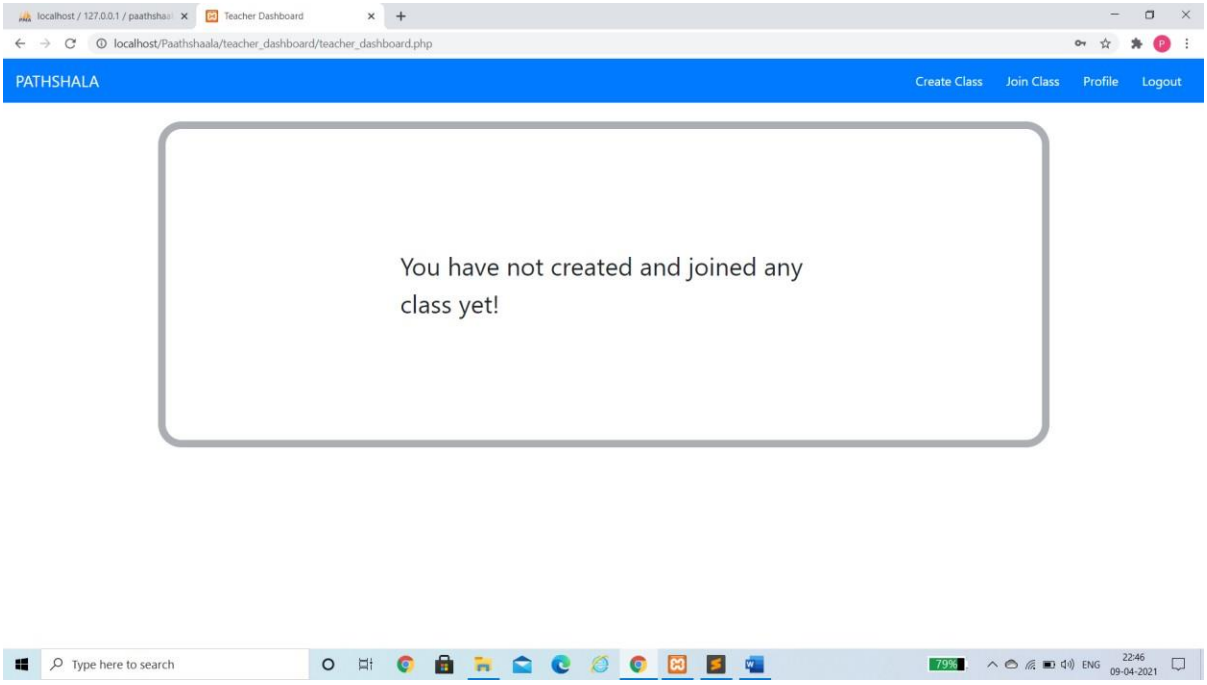


Image 12: Teacher dashboard – No classes created

Create a class, modal appears, and we have to enter class name

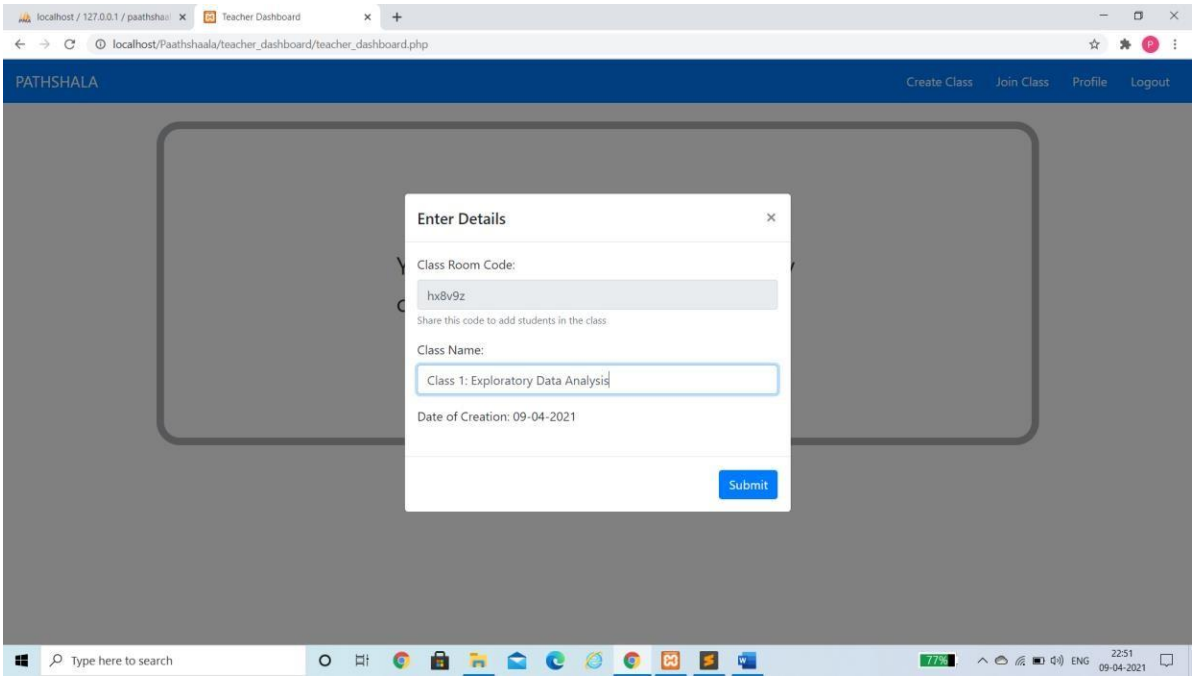


Image 13: Teacher dashboard – Creating Class

Class gets created, as seen

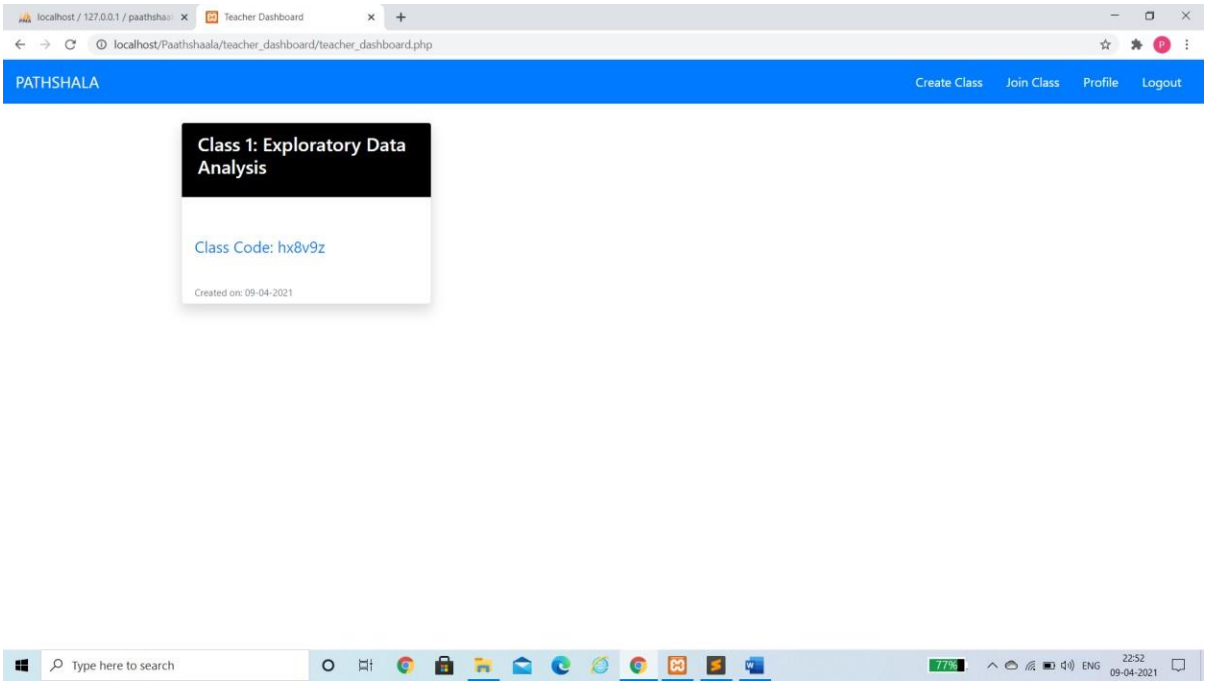


Image 14: Teacher dashboard – Showing Class on Dashboard

Similarly, creating three more classes

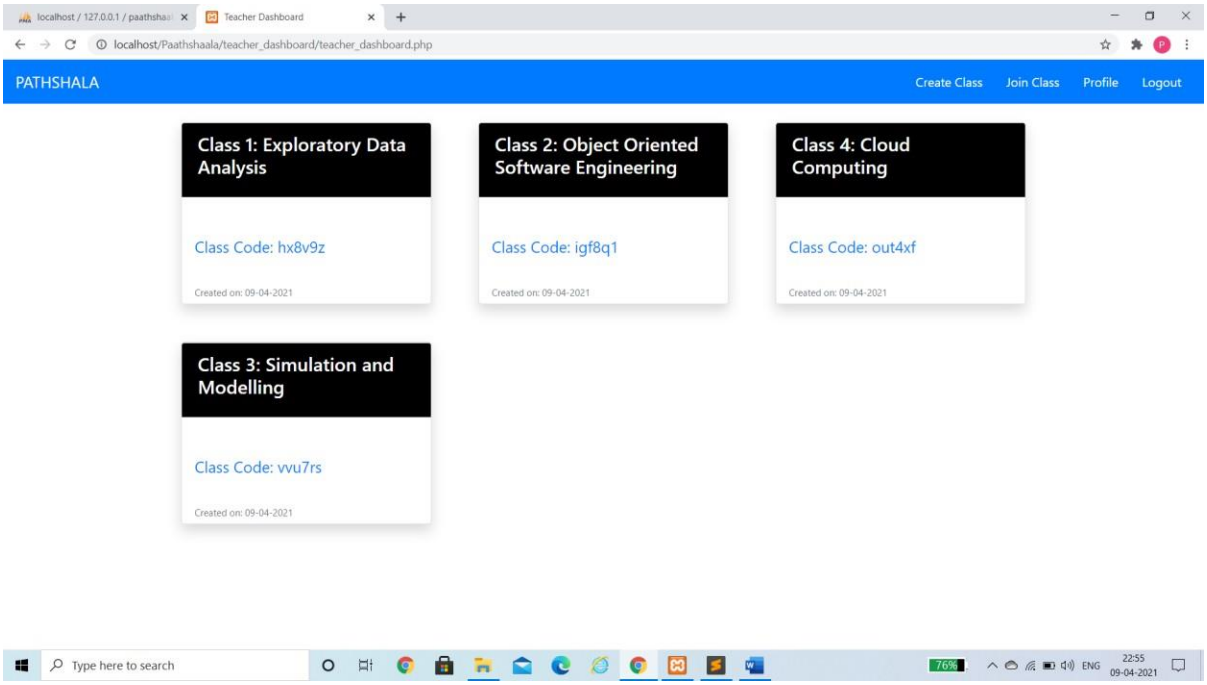


Image 15: Teacher dashboard – Multiple Classes on Dashboard

PROFILE

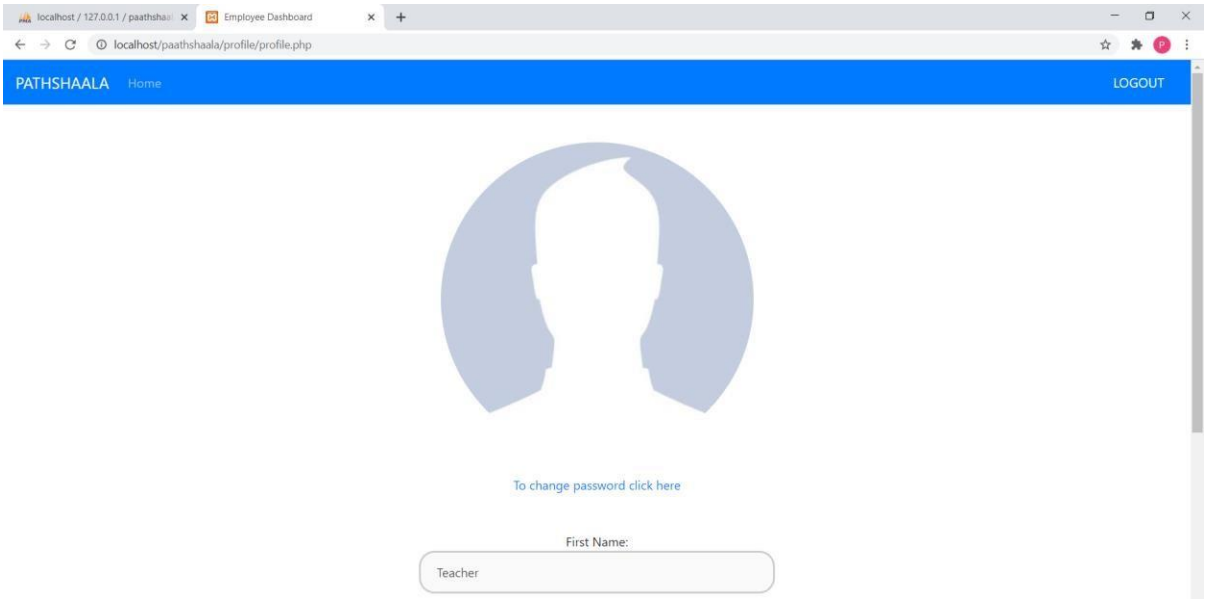


Image 16: Profile Page

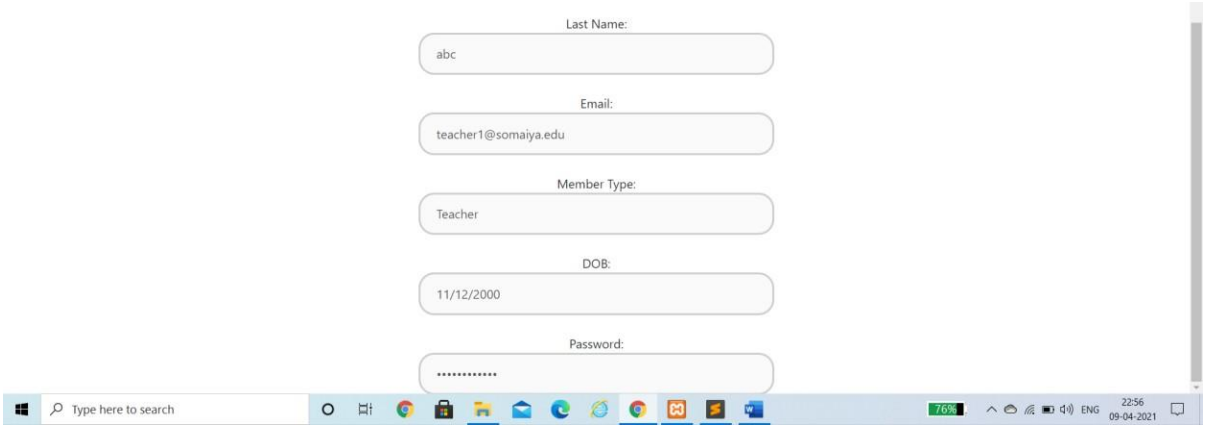


Image 17: Profile Page Continued

Changing password

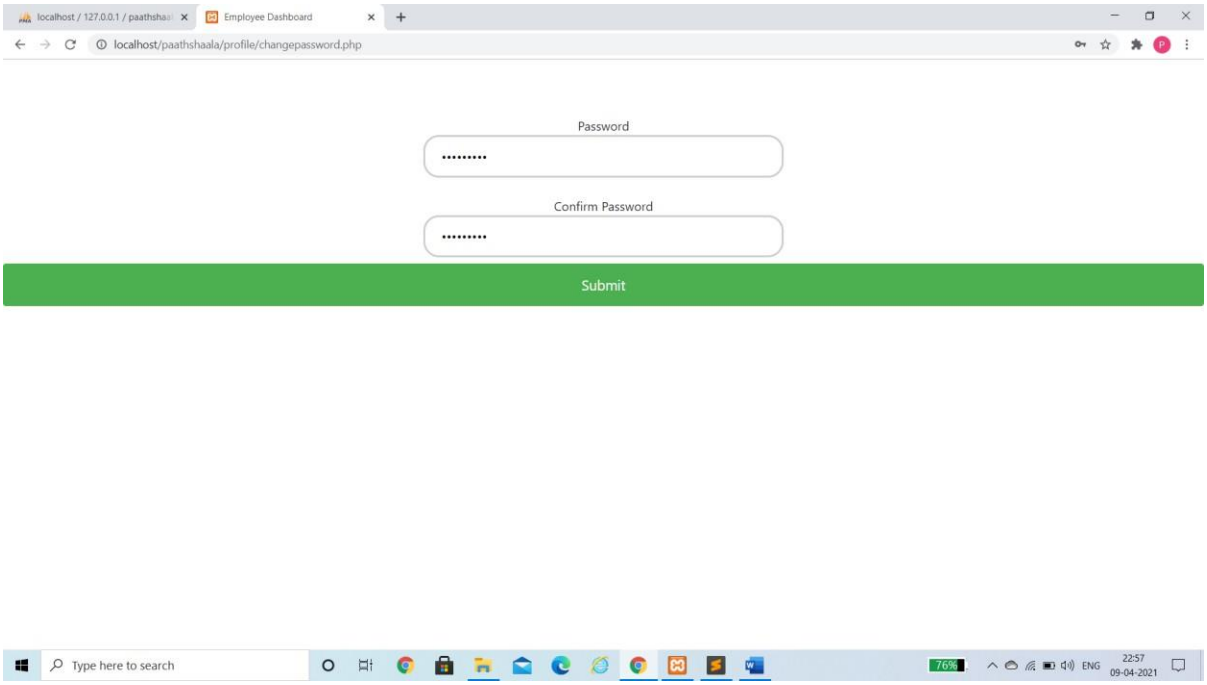


Image 18: Change Password Page

CLASS

Initially there are no Quizzes, Assignments, Announcements or Lectures created

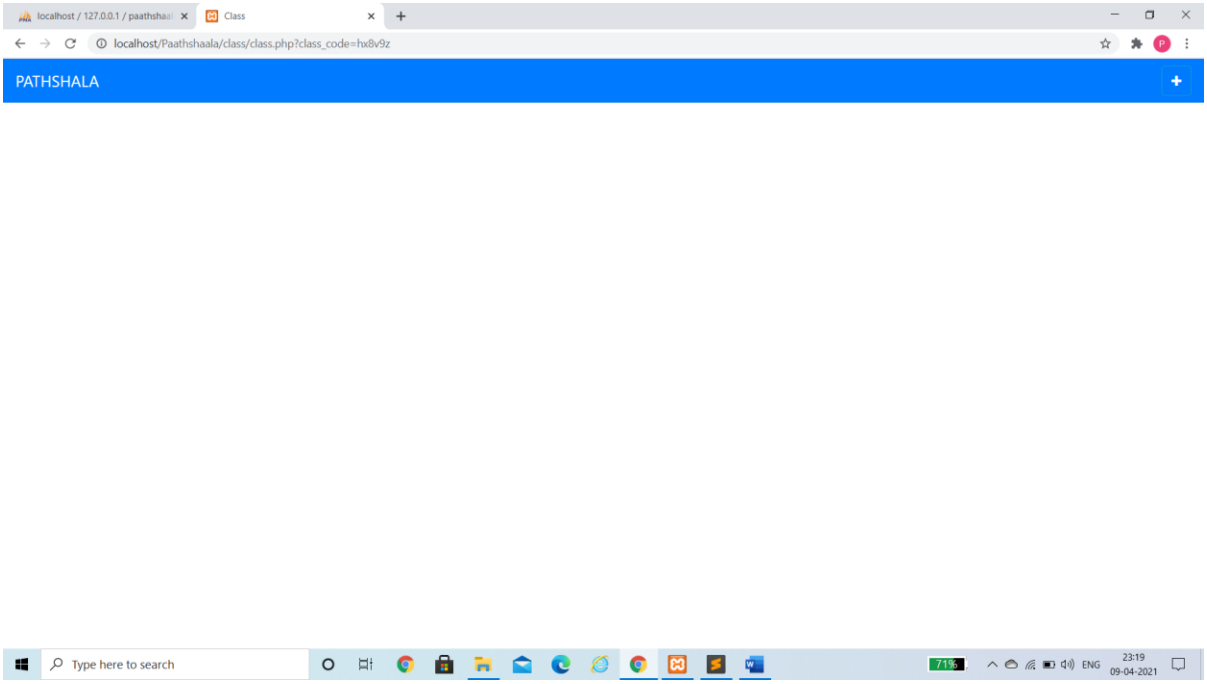


Image 19: Class page

Four options are available on top right corner

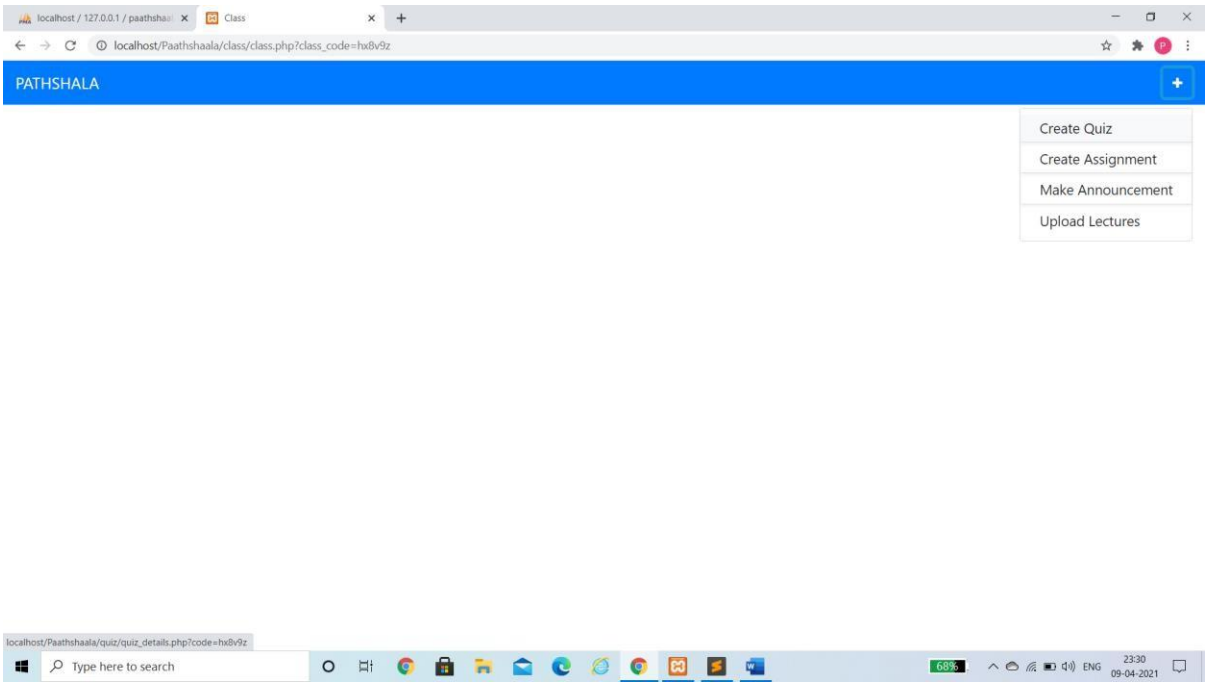


Image 20: Features Provided to Teacher

Creating a quiz

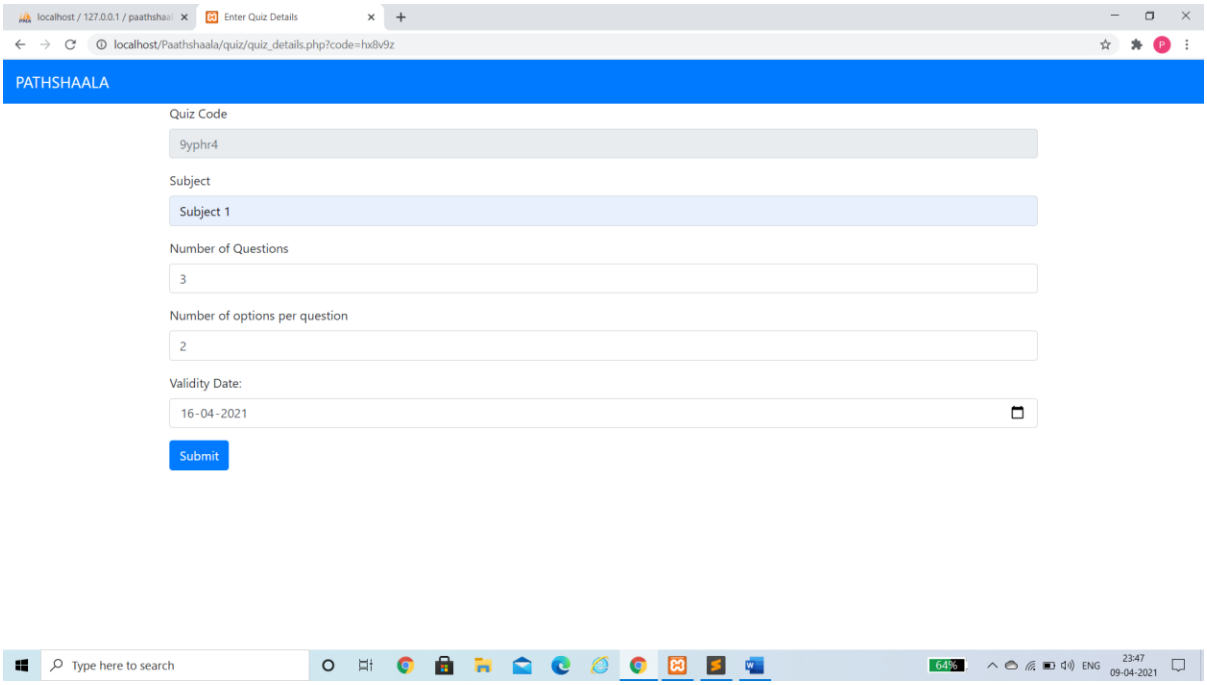


Image 21: Creating a Quiz

Form to fill in quiz questions, options, answers and marks for each question

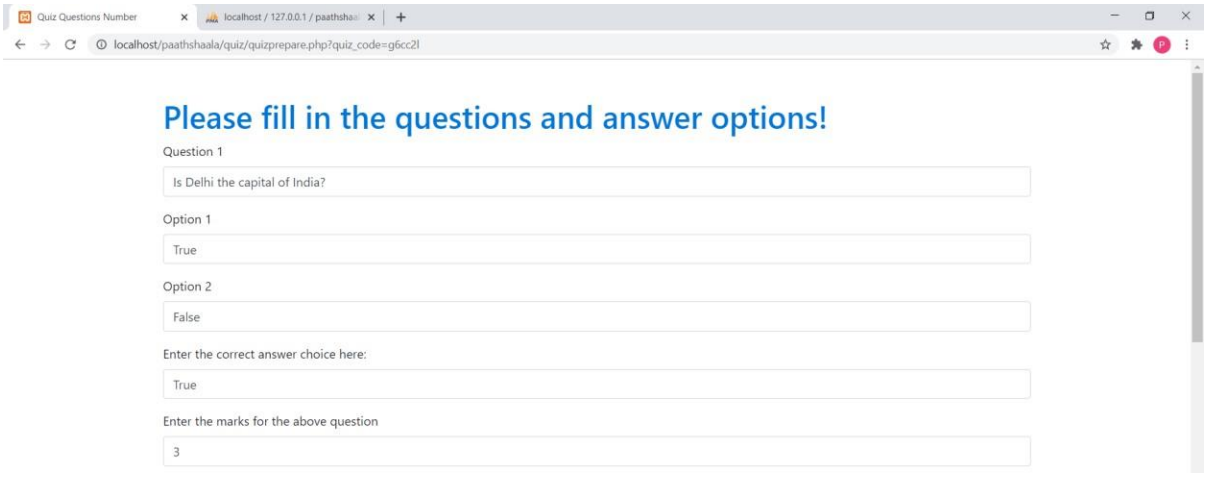


Image 22: Quiz details 1

Image 23: Quiz details 2

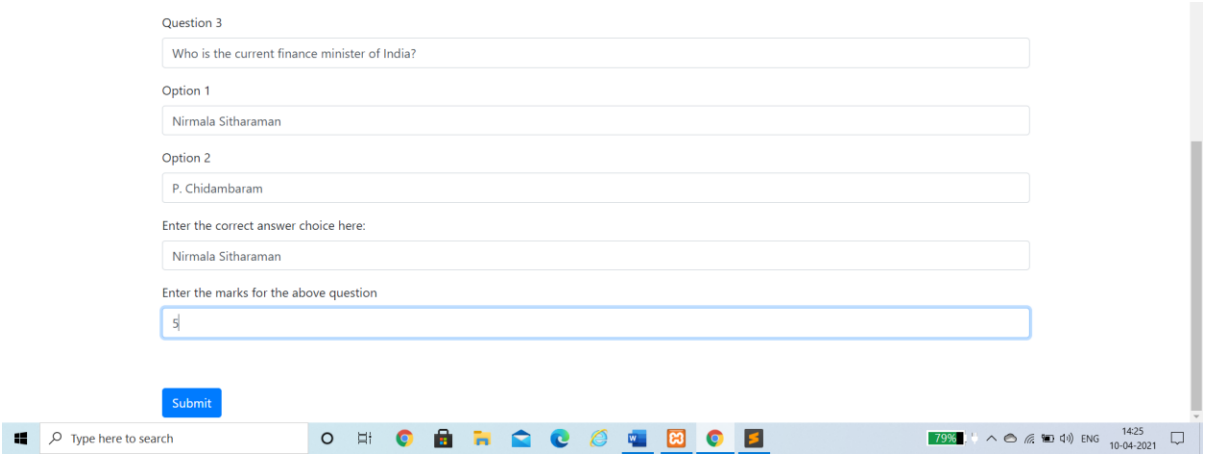


Image 24: Quiz details 3

Quiz gets created

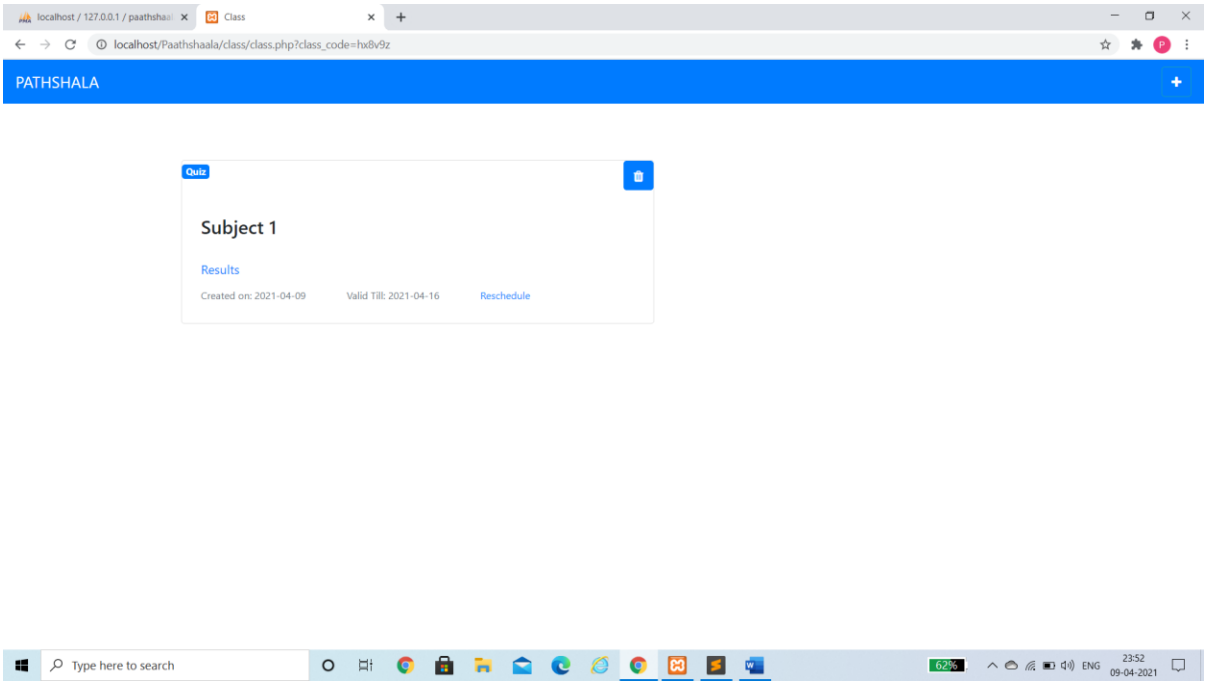


Image 25: Quiz displayed inside Class

Reschedule the quiz

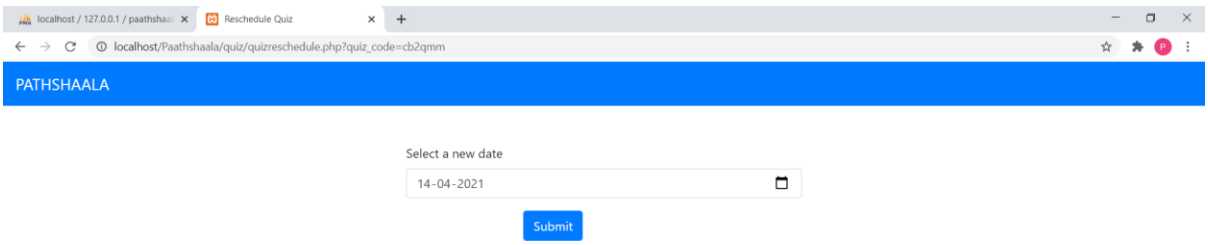


Image 26: Rescheduling Quiz

Results of quiz

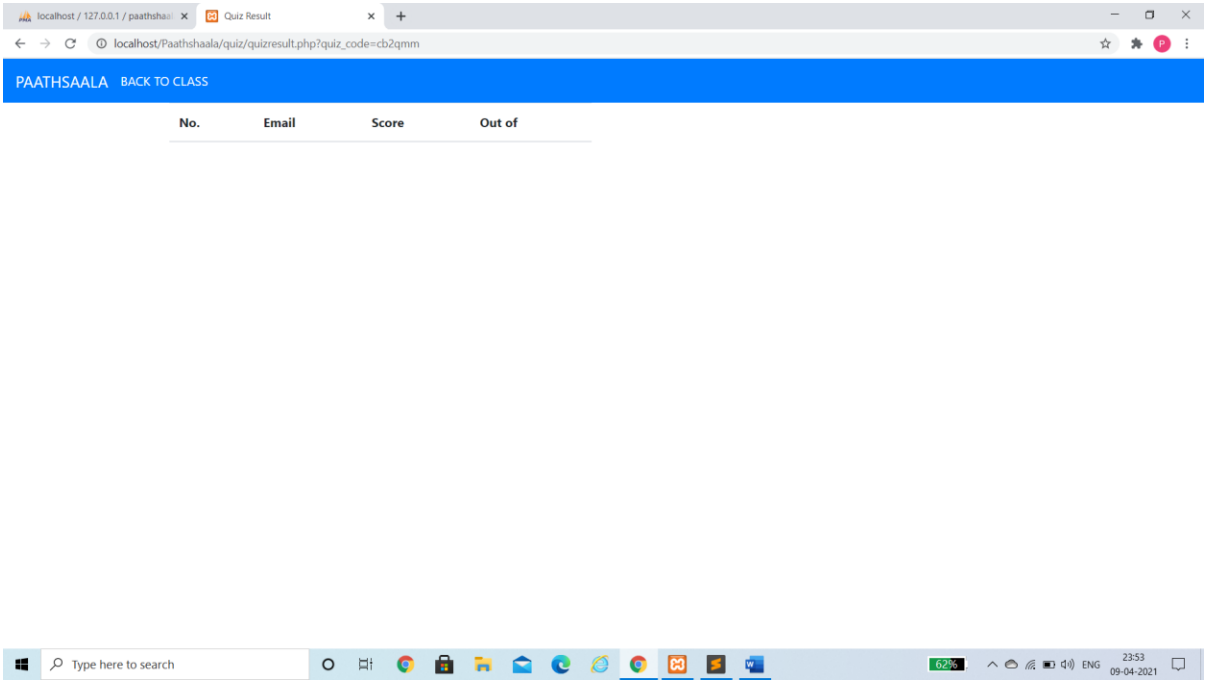


Image 27: Results of Quiz

Creating Assignment

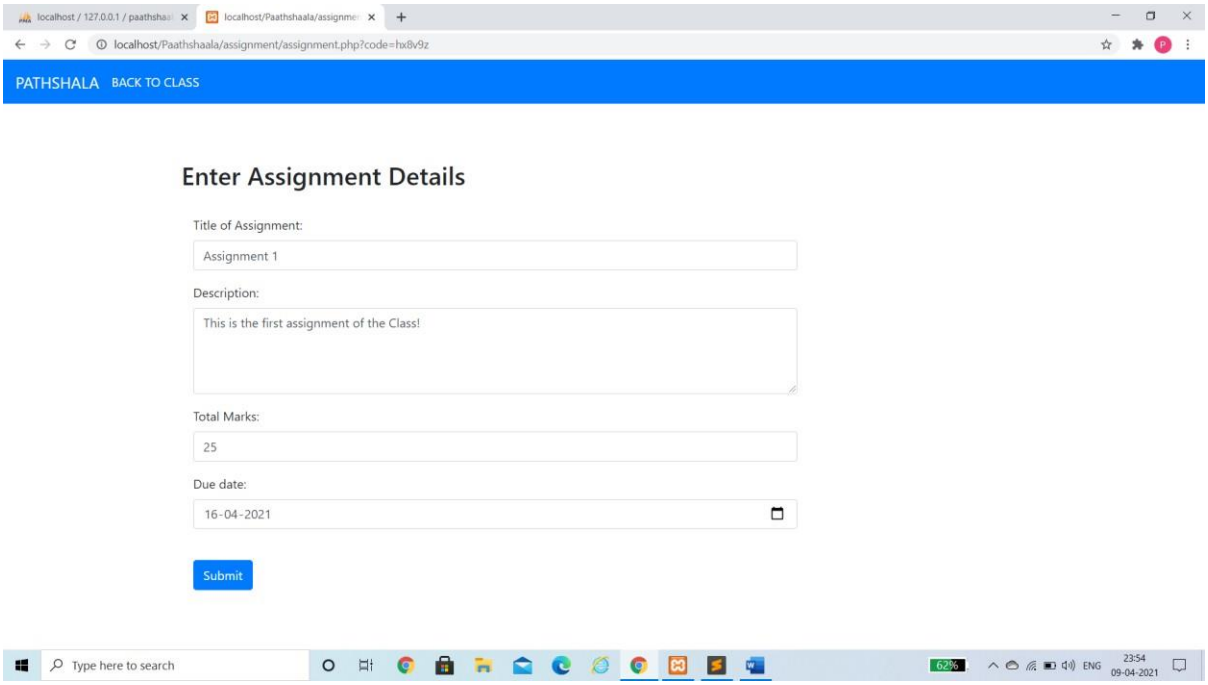


Image 28: Creating Assignment

Assignment gets created

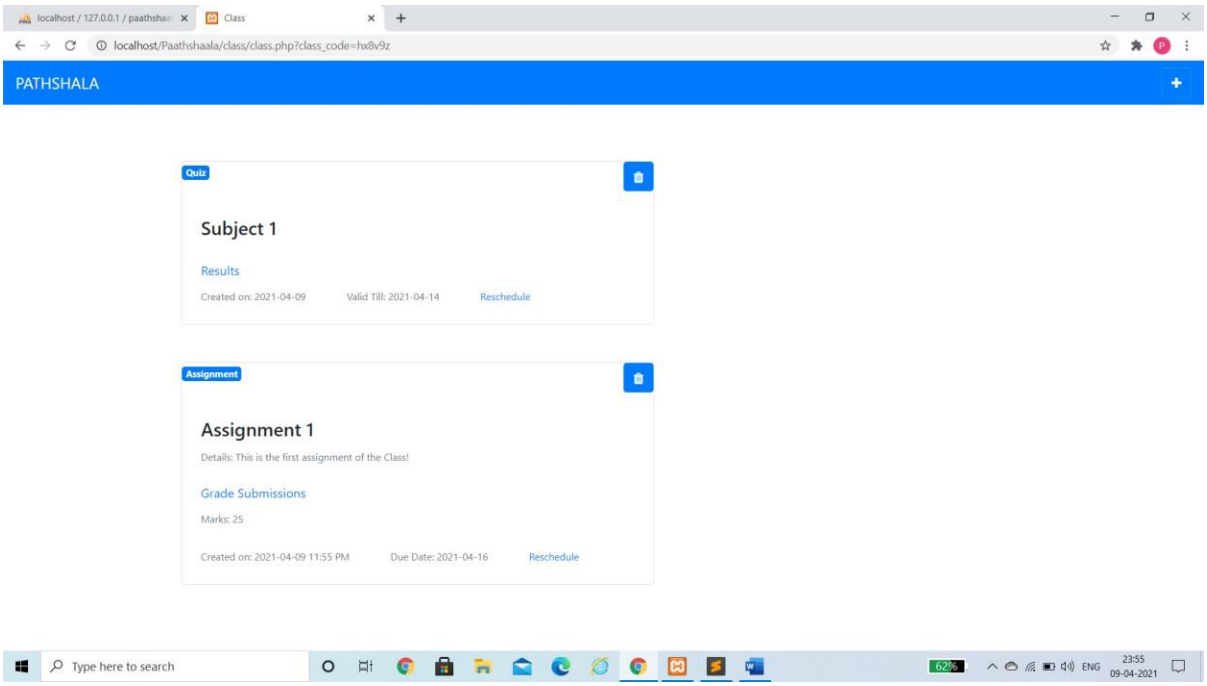


Image 29: Assignment displayed inside Class

Reschedule the assignment

Image 30: Rescheduling Assignment

Grading the submission

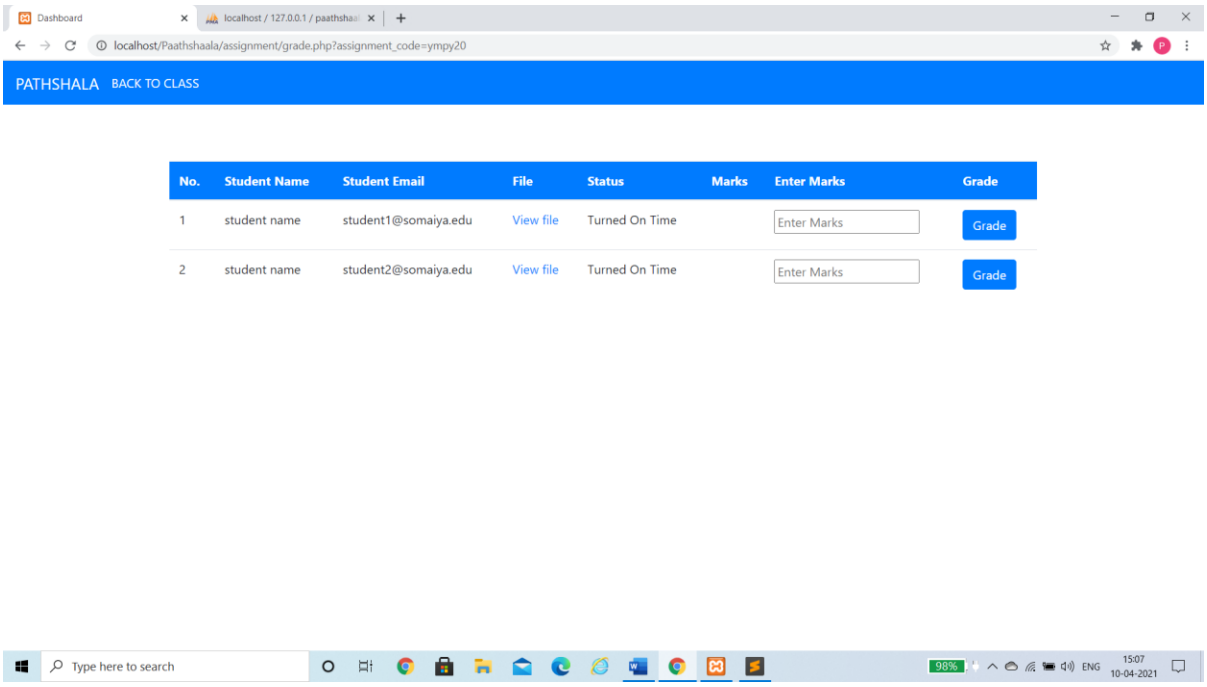


Image 31: Grading Submissions page

Teacher can grade the assignments

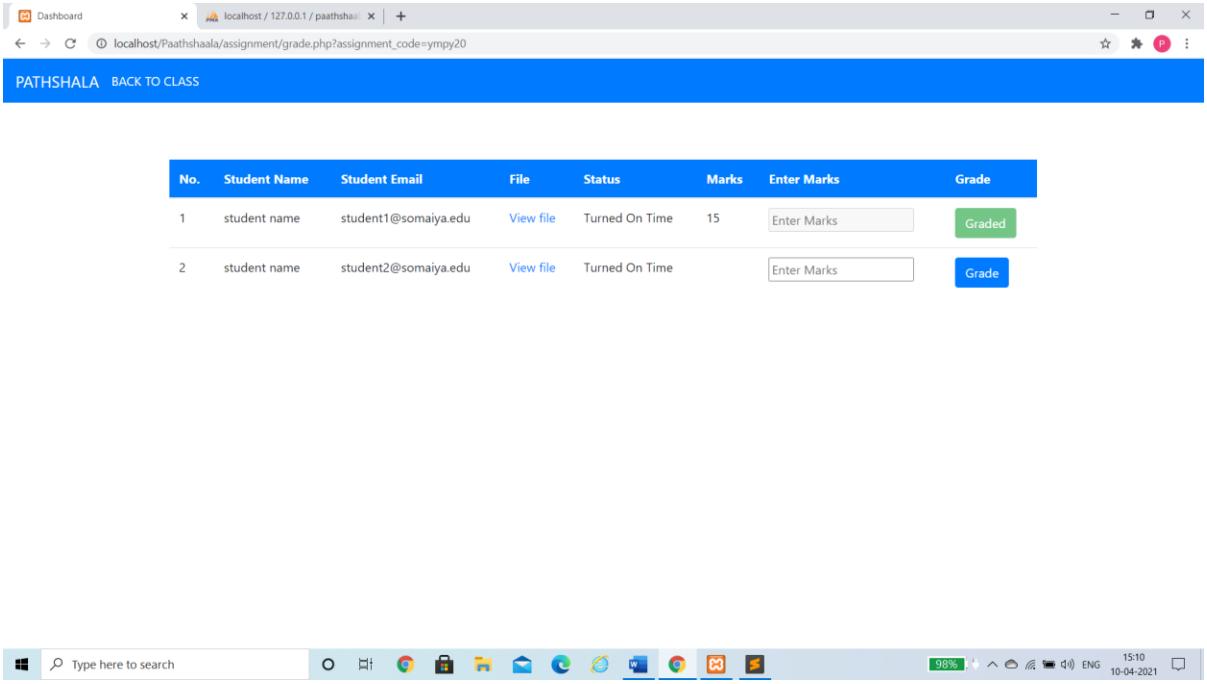


Image 32: Entering marks for Submissions

Make Announcement

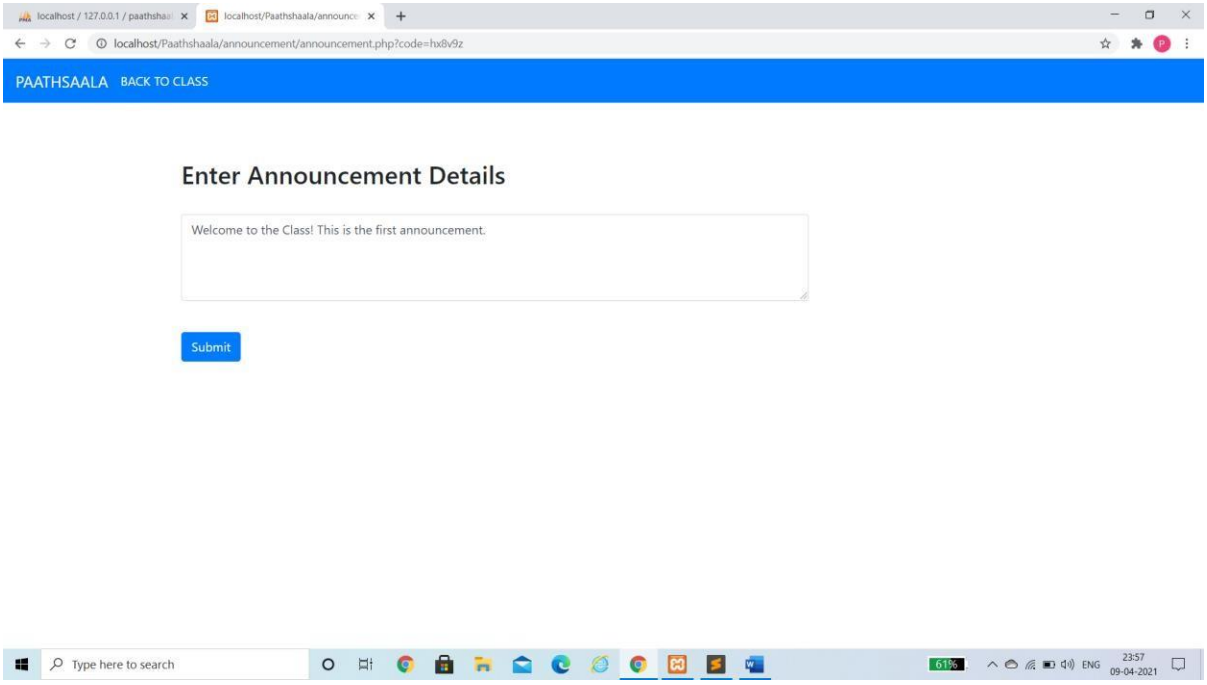


Image 33: Making Announcement

Announcement gets created

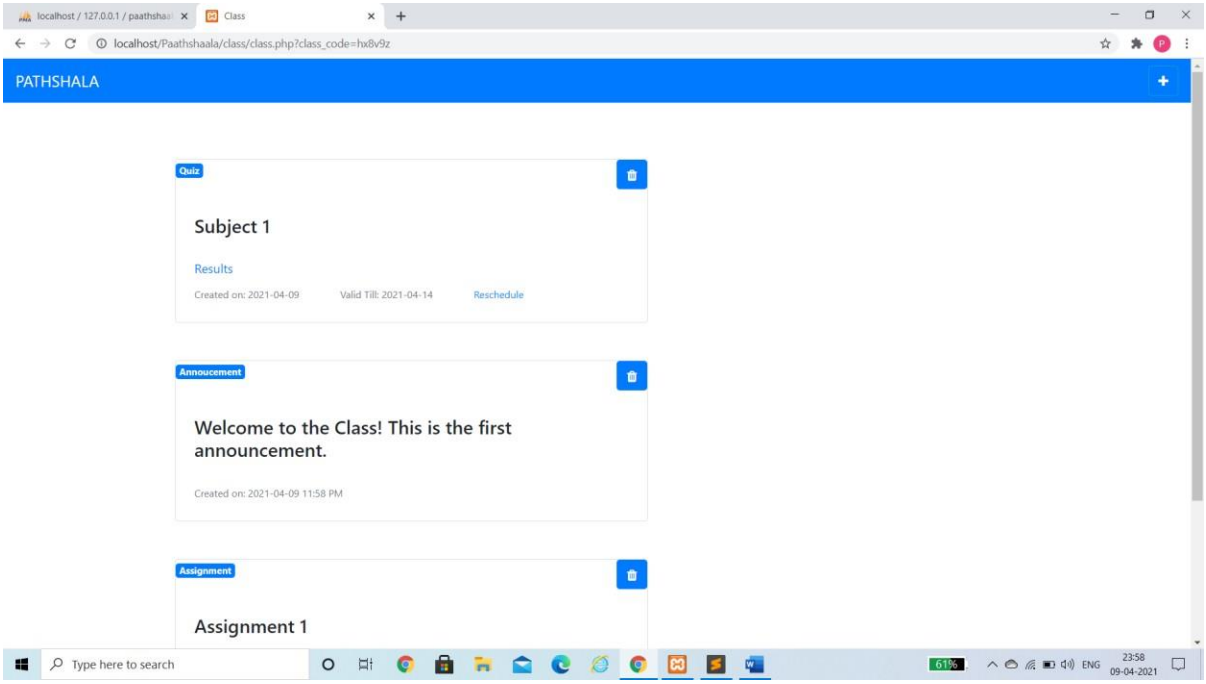


Image 34: Announcement displayed inside Class

Upload Lecture

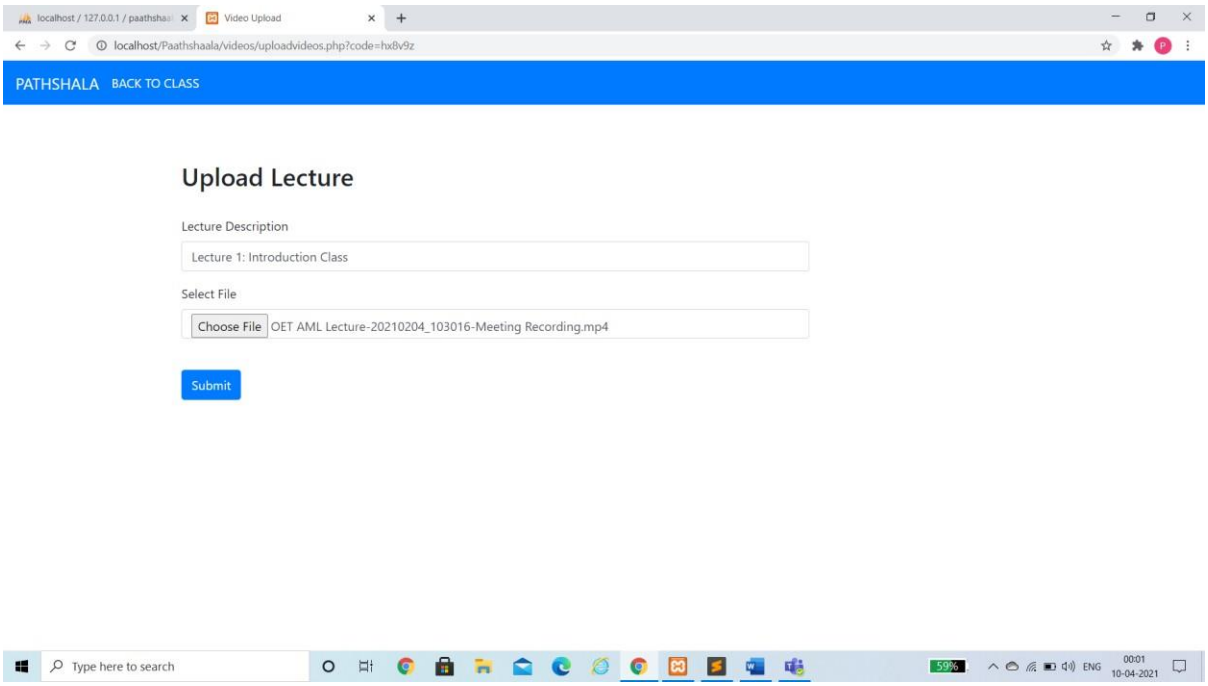


Image 35: Uploading Lecture

Uploaded lecture can be visible

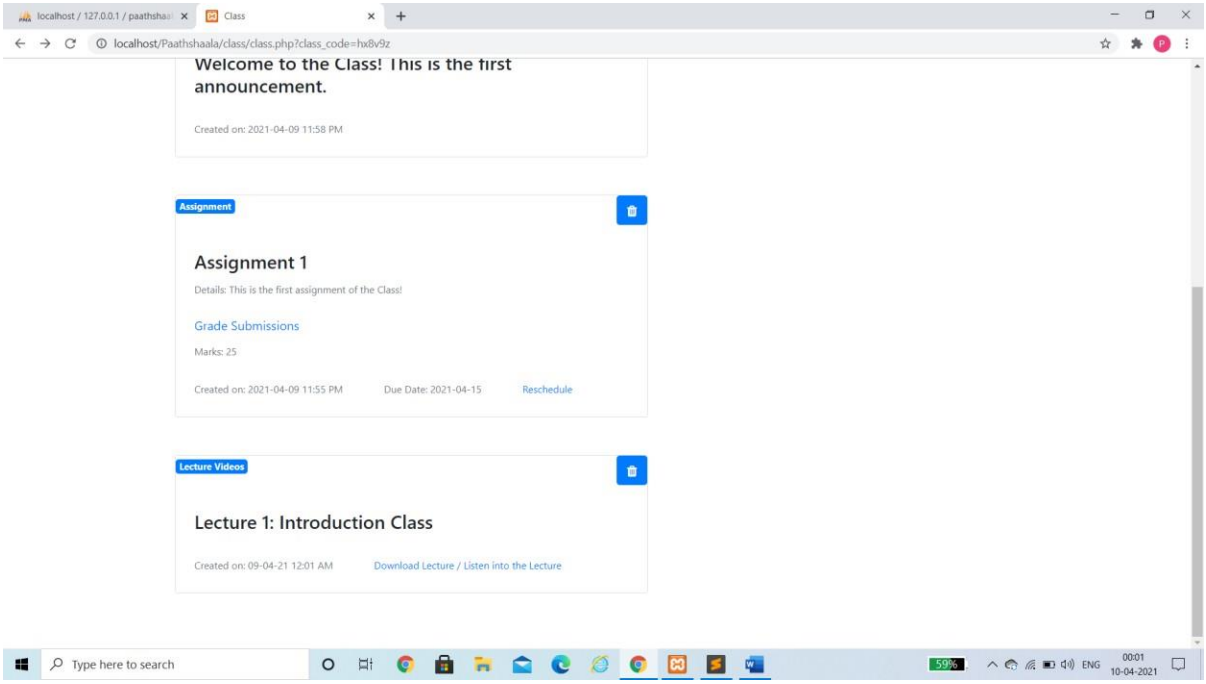


Image 36: Uploaded lecture displayed inside Class

Download or listen to the uploaded lecture

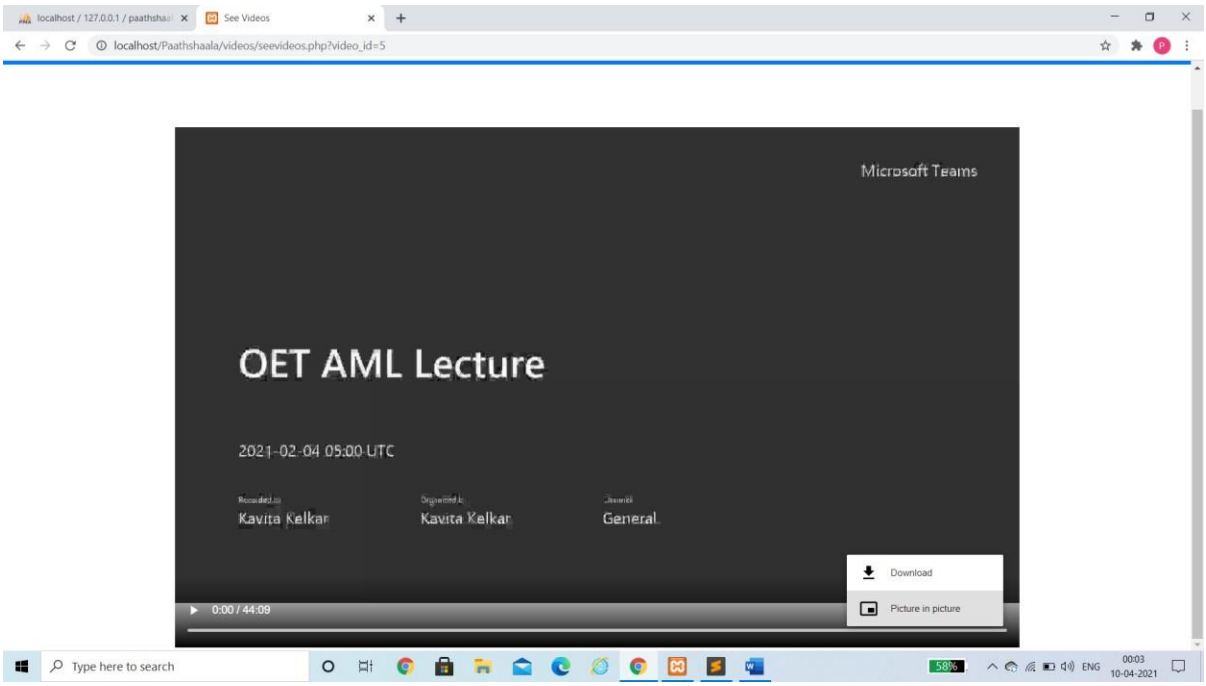


Image 37: Listeing or Downloading Lecture

STUDENT DASHBOARD

Signup as a student

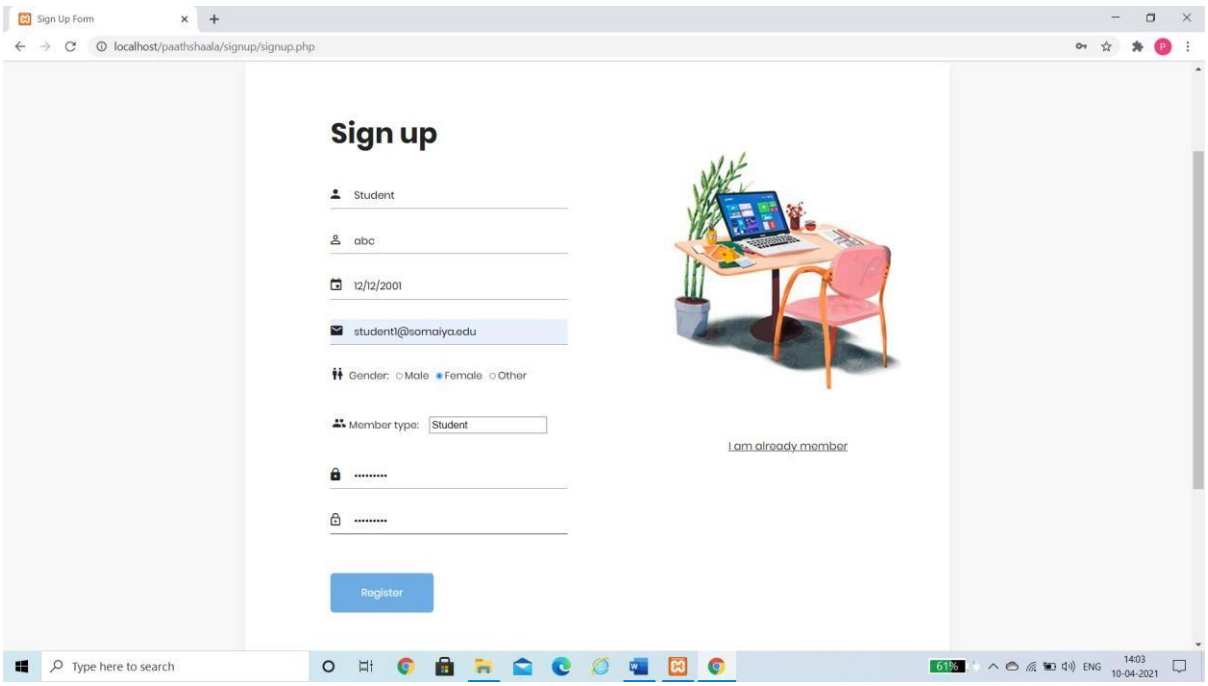


Image 38: Signup as a student

Login as a student

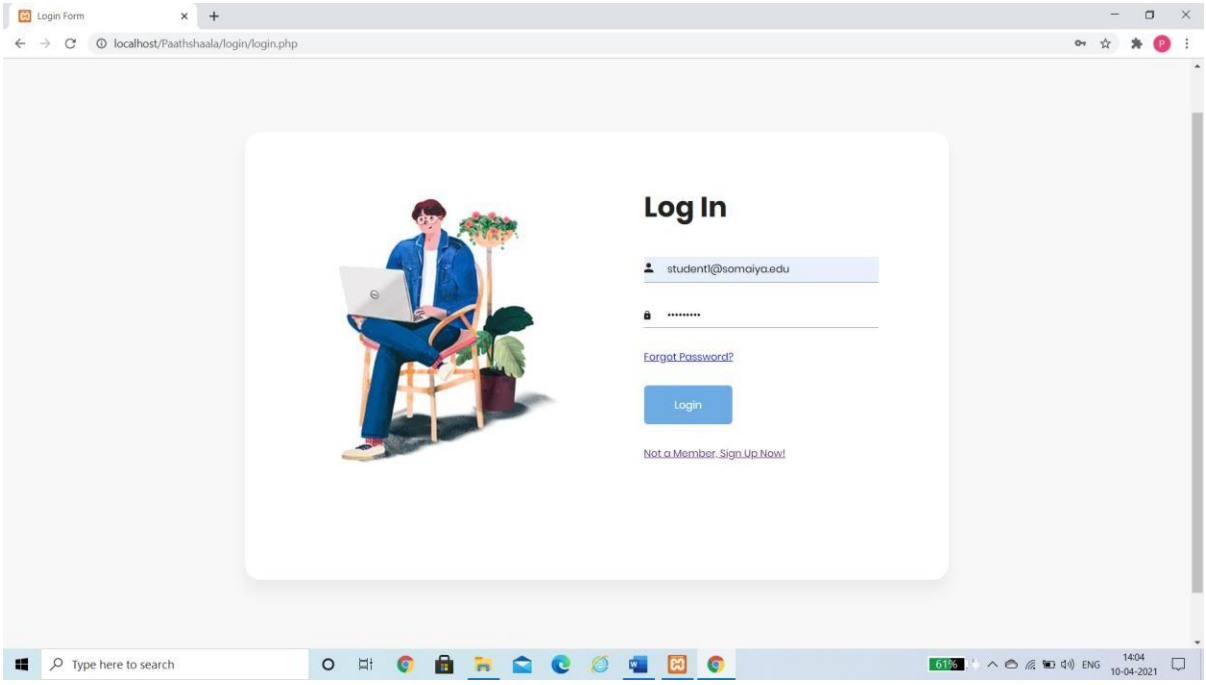


Image 39: Login as a student

Initially, no classes are joined by the student

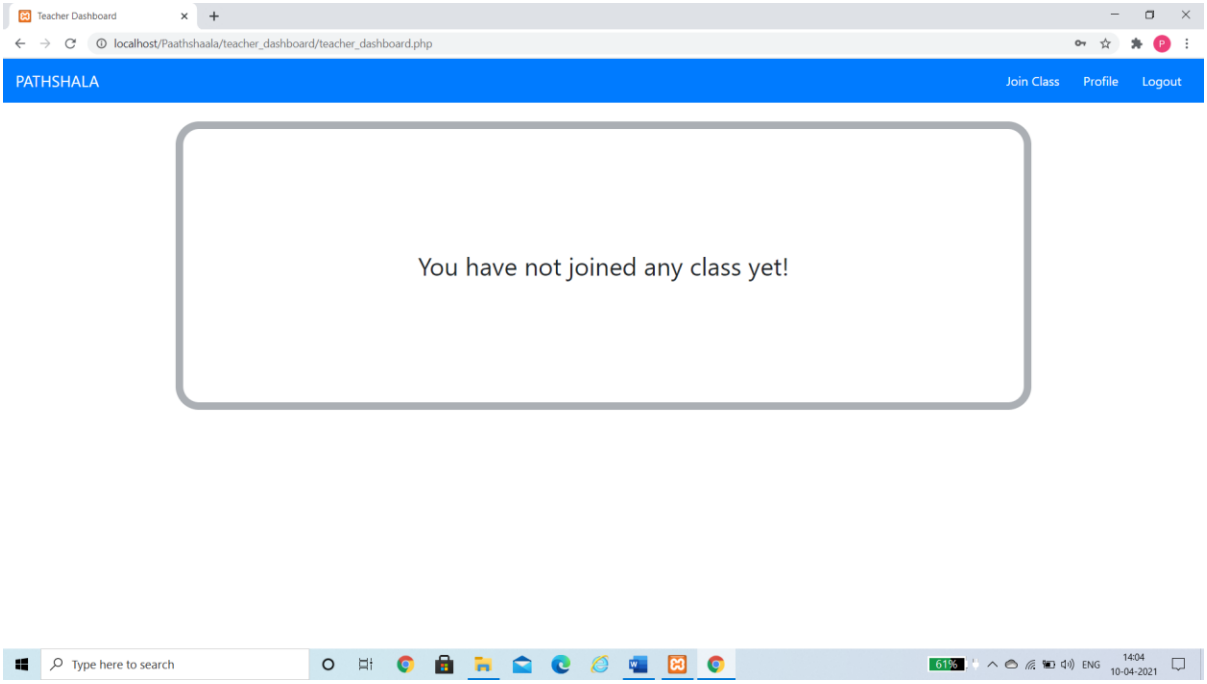


Image 37: Student Dashboard – No class created

Joining the class 1: Exploratory Data Analysis with class code shared by teacher

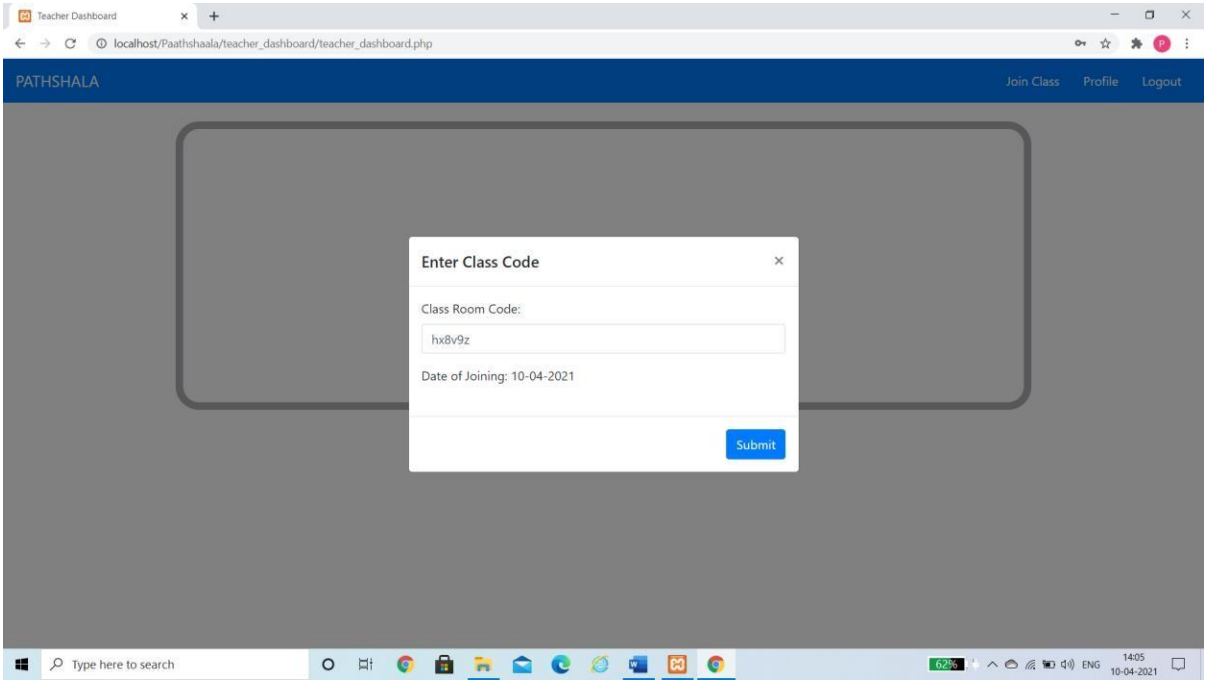


Image 38: Joining a class

The student joins the class

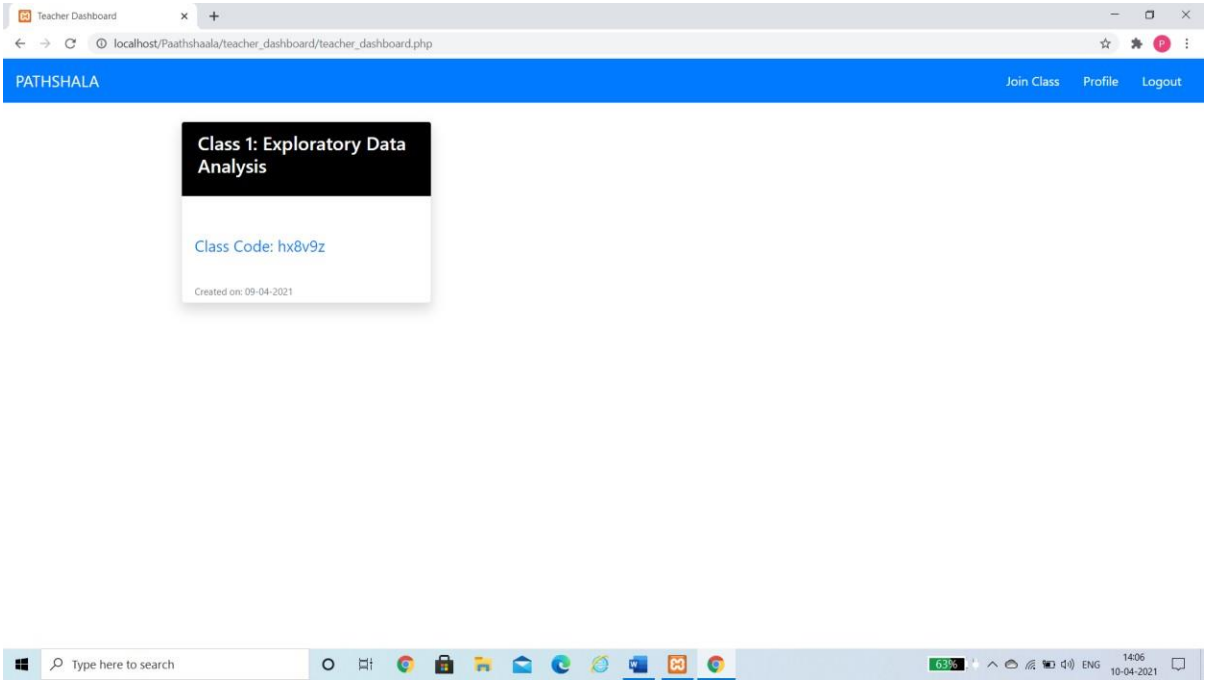


Image 37: Joined class Displayed on the dashboard

Class 1 contents can be viewed by the student

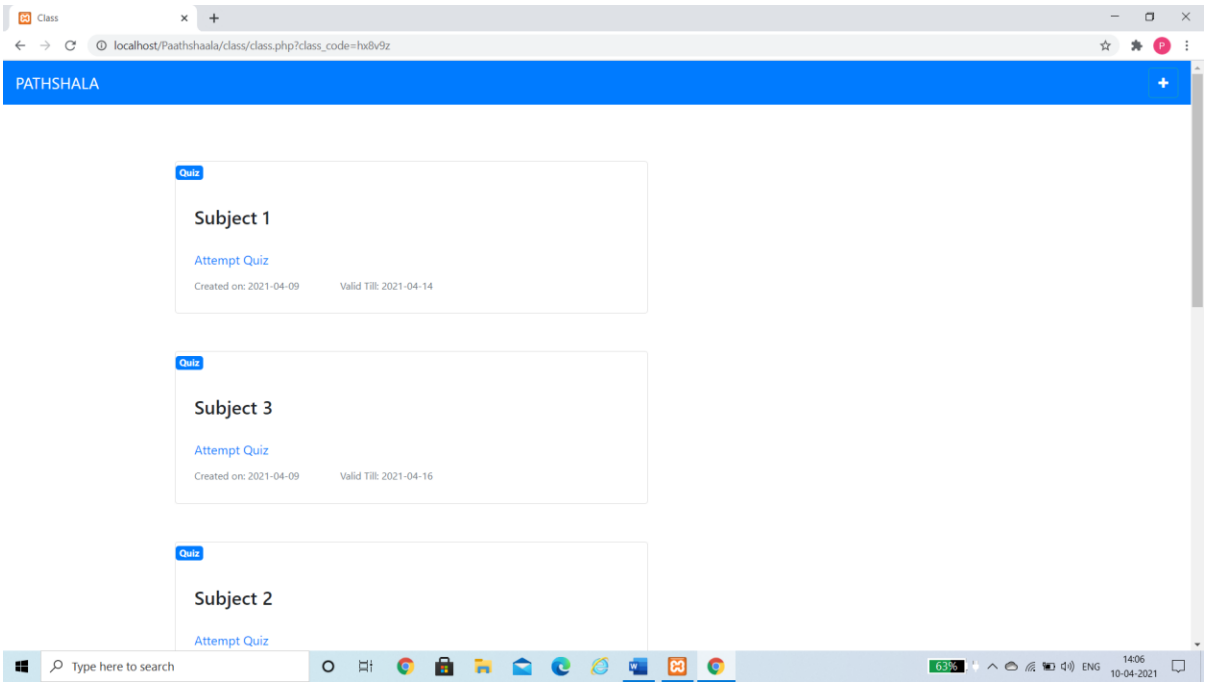


Image 38: Displays content inside a class

Attempting quiz

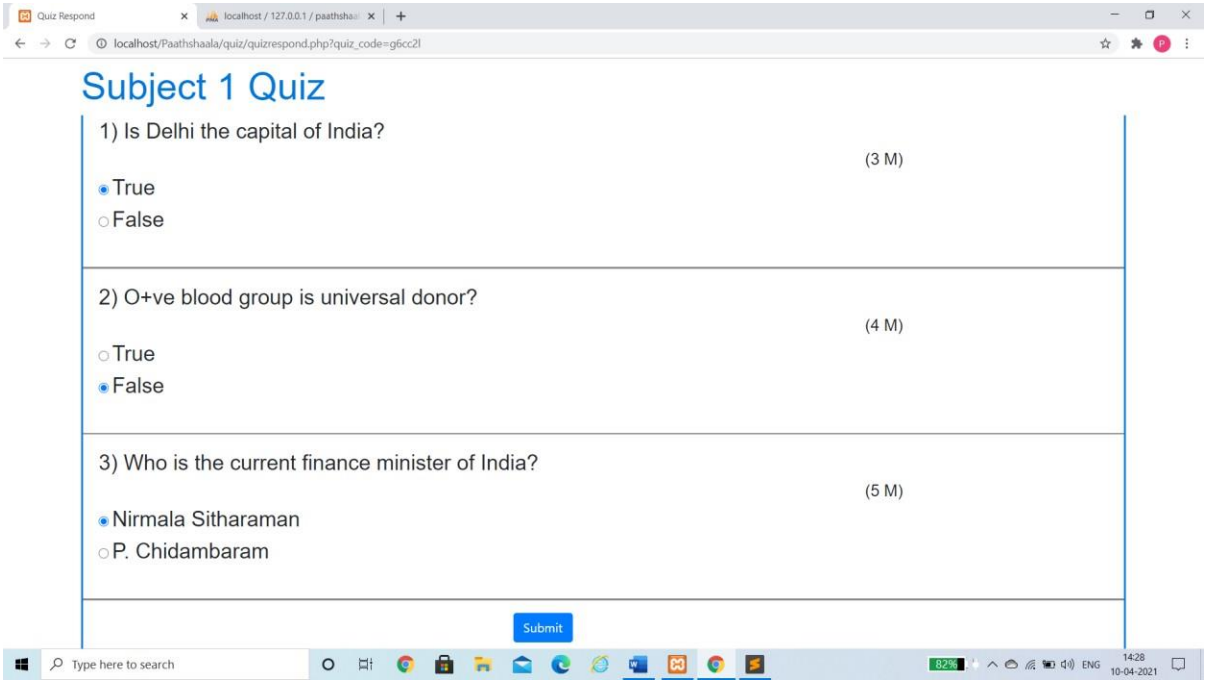


Image 39: Attempting Quiz

Results of the quiz are visible after attempting the quiz

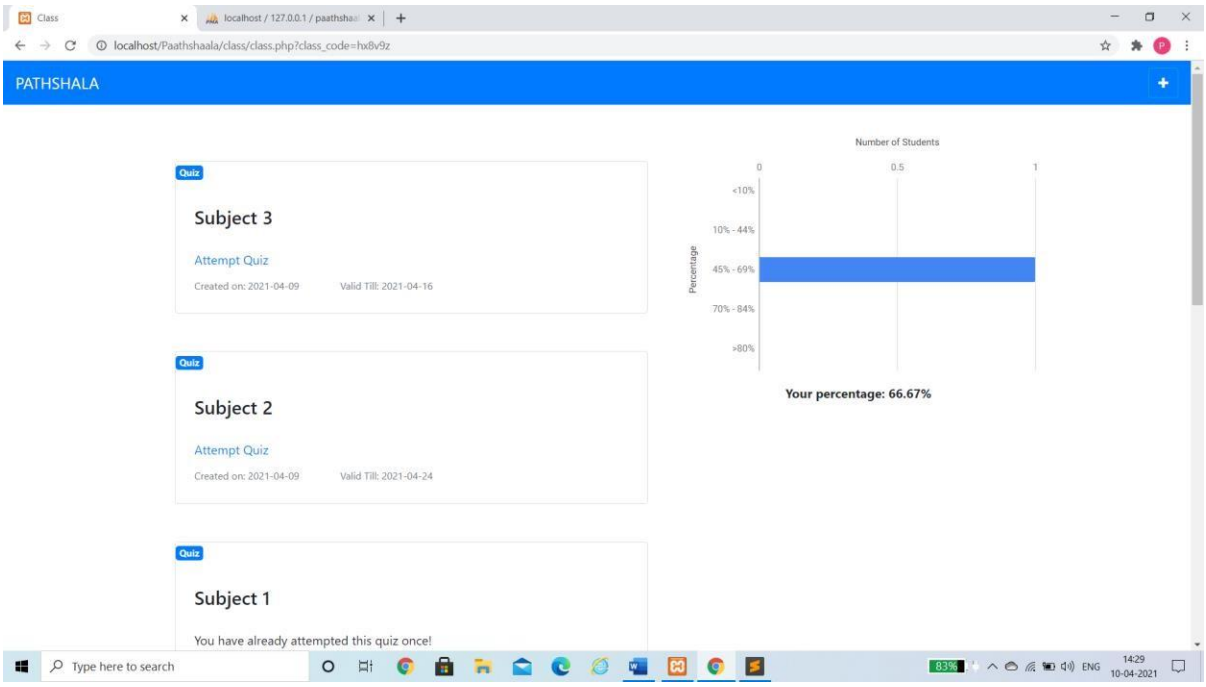


Image 40: Results of the quiz

Attempting more quizzes, percentage is also changed accordingly

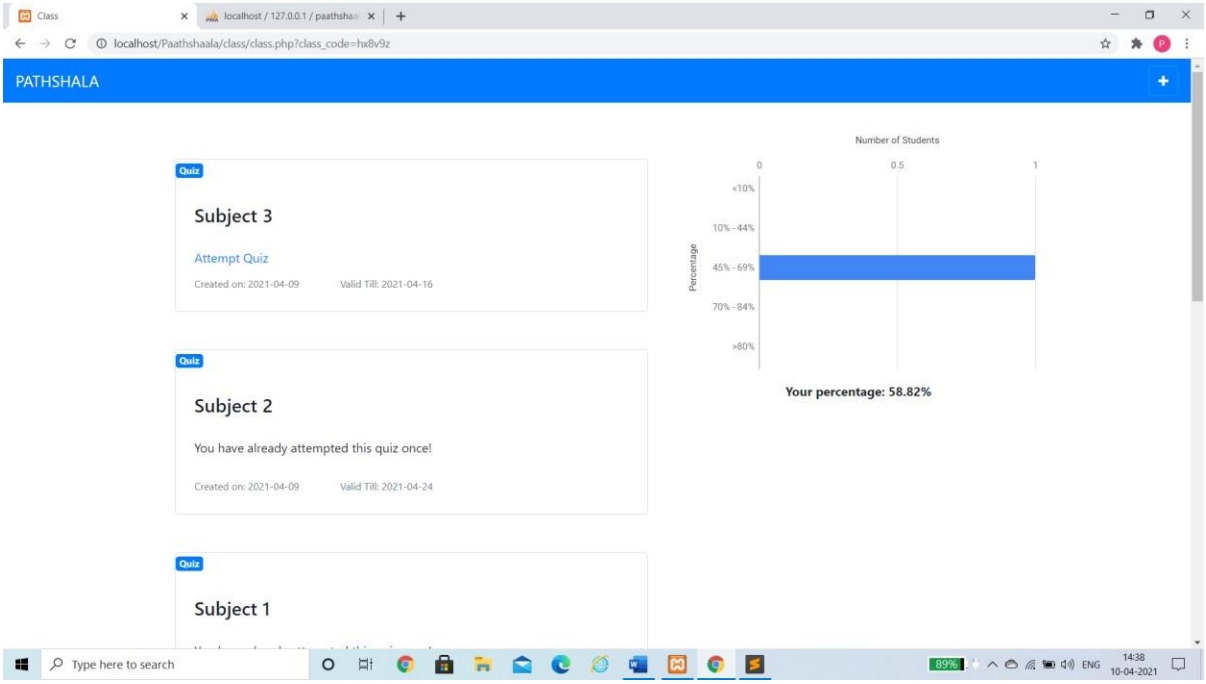


Image 41: Results of the multiple quizzes attempted

Submitting Assignment

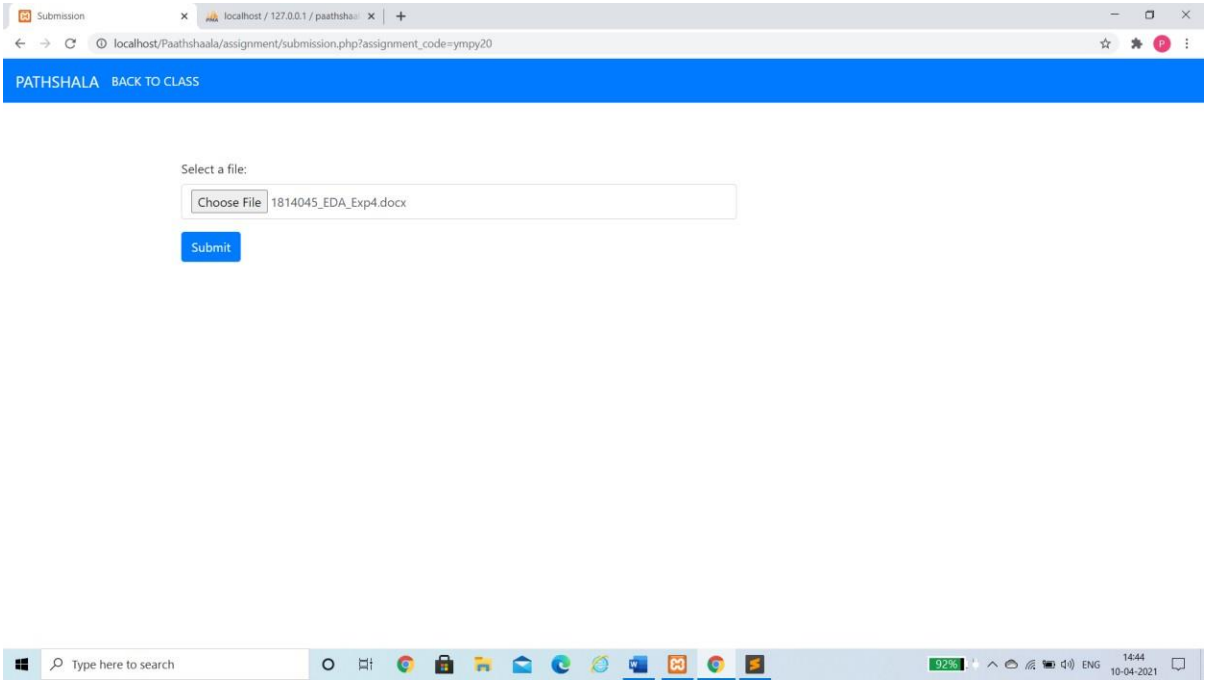


Image 42: Submitting Assignment

The statistics of submission can be viewed

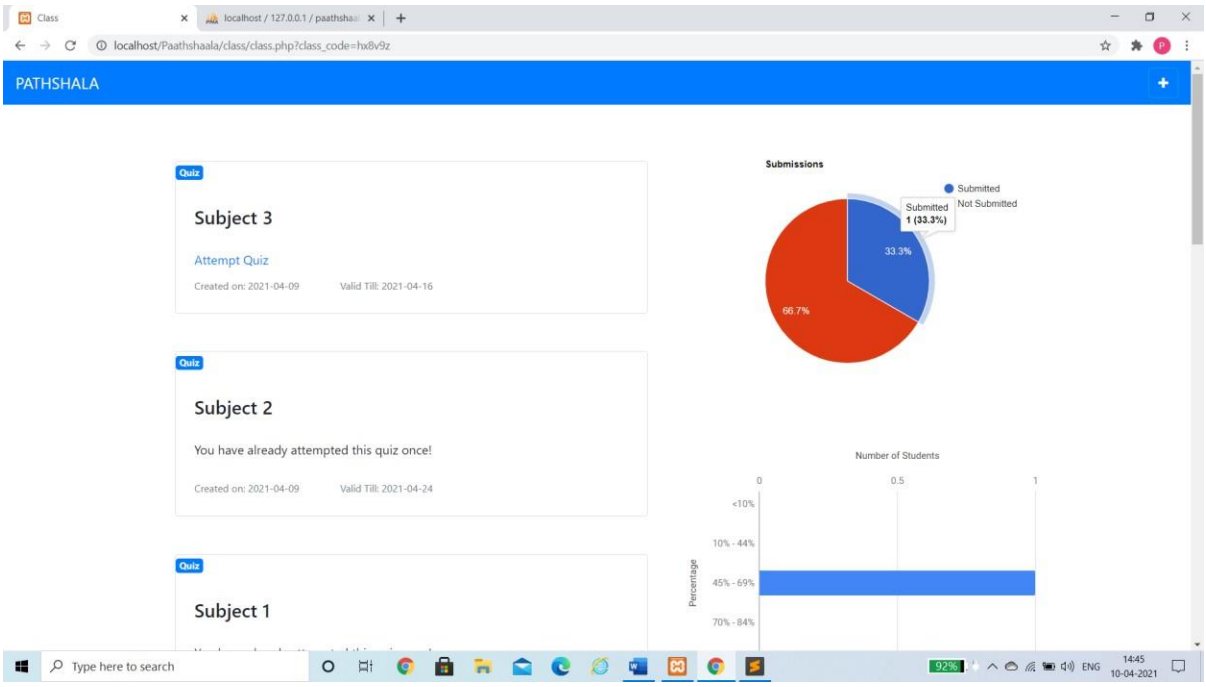


Image 43: Statistics for Submissions

If the quiz and assignments are submitted once, you cannot submit or attempt again

Image 44: After Attempting the Quiz once

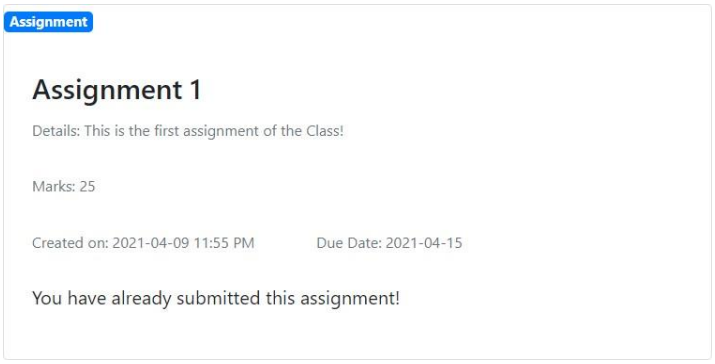


Image 45: After Submitting the Assignment once

Student can view and download the lectures uploaded by the teacher

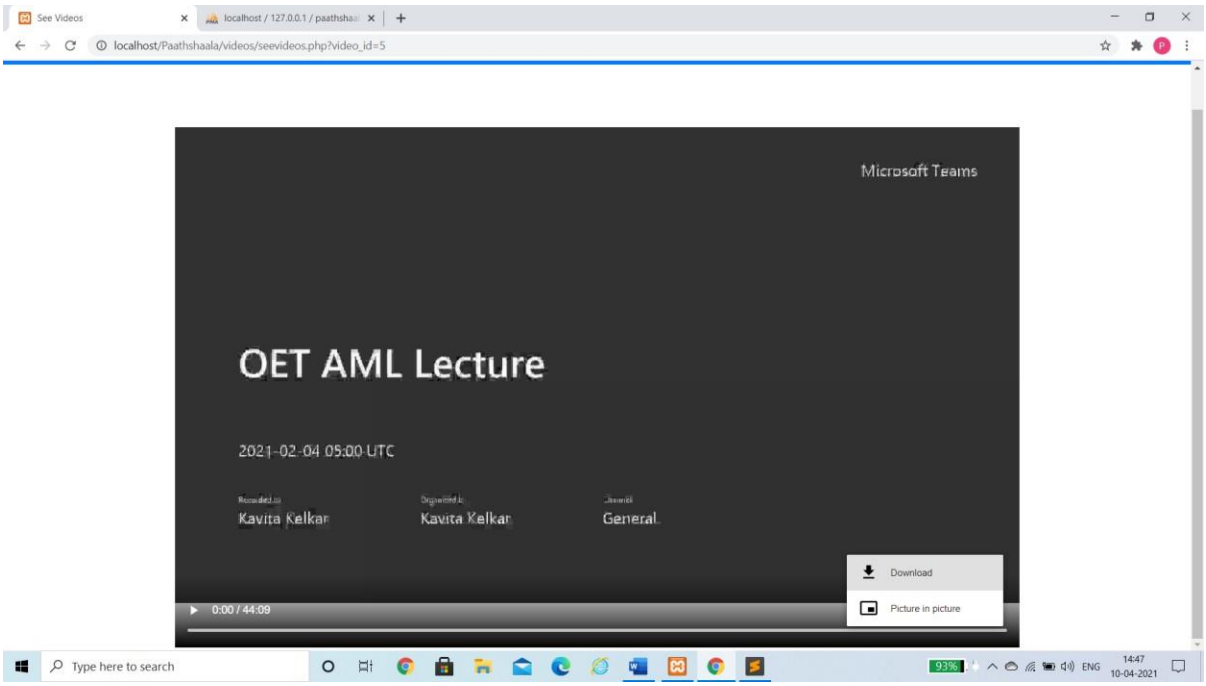


Image 46: View or Download Uploaded Lecture

Student can view the announcements created by the teacher

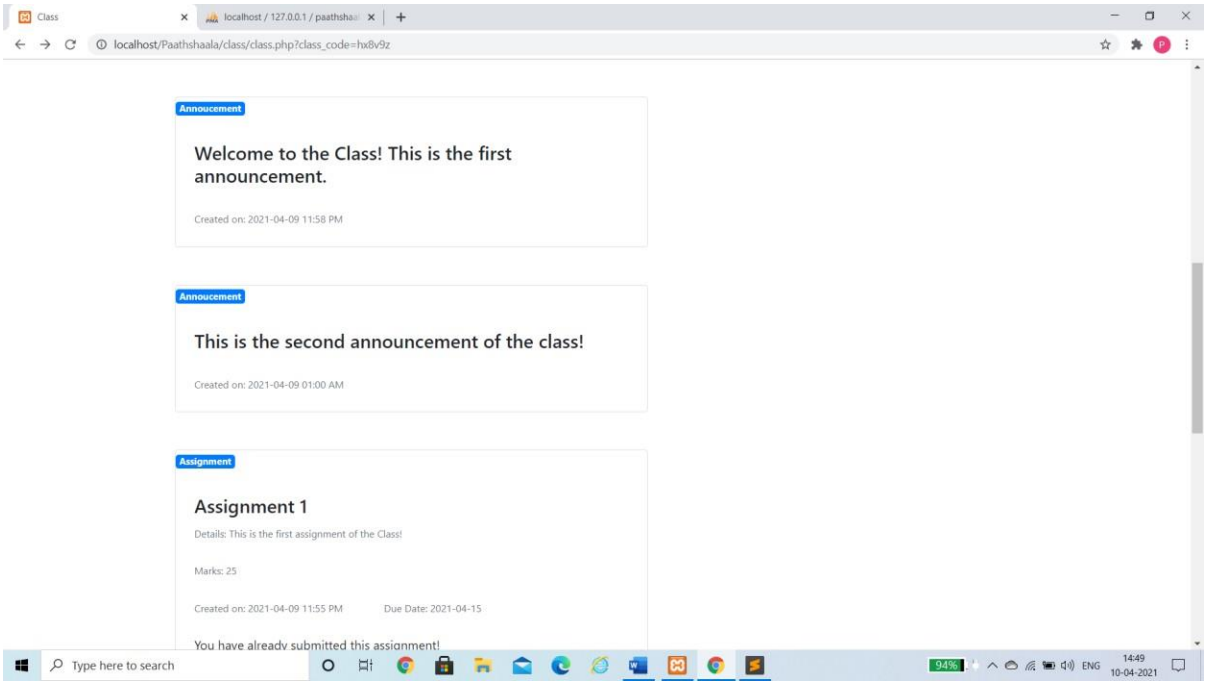


Image 47: View Annoncements

If more students attend the quizzes in the classroom, it gets reflected in the statistics

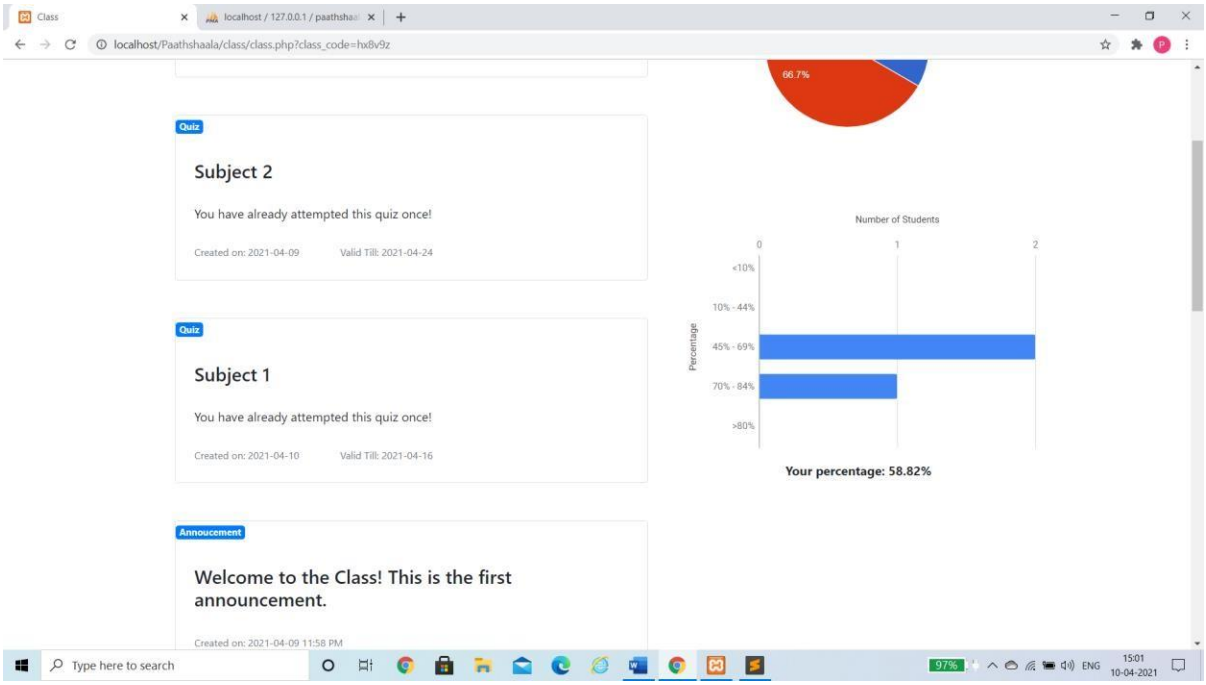


Image 48: Statistics of Attempted Quizzes

Student can view their graded assignments from top right corner ‘View Marks’

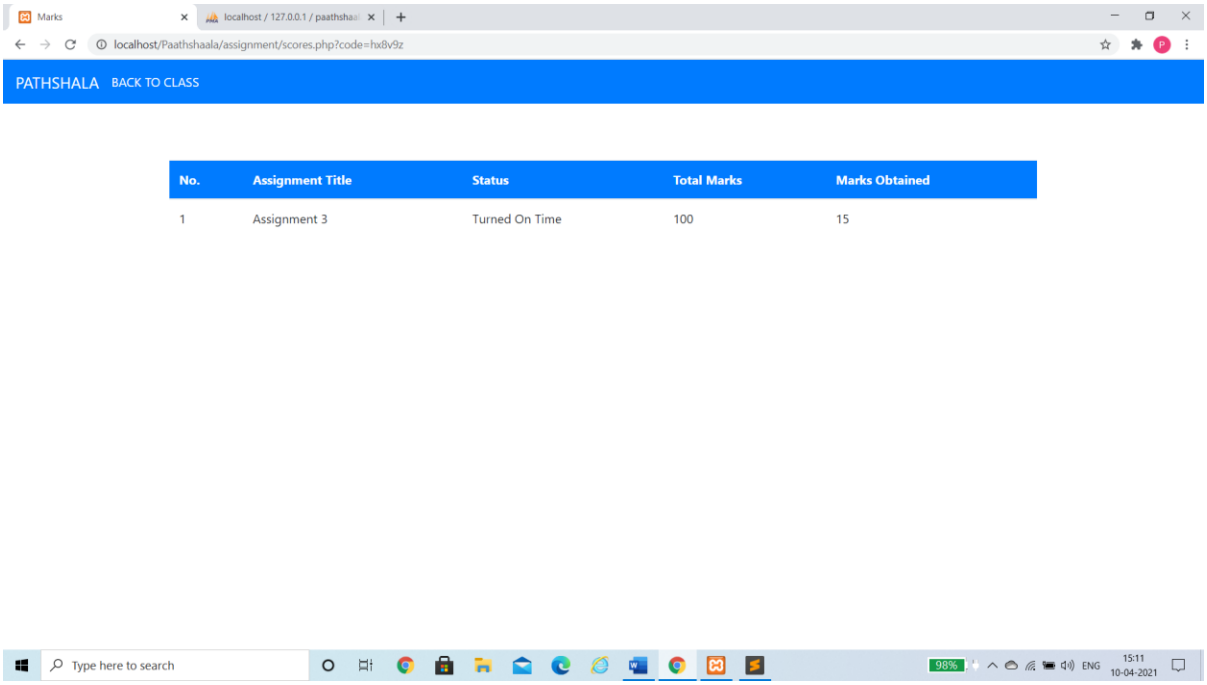


Image 49: View Marks

DATABASE

Database Name: Paathshaala

Table 1: members

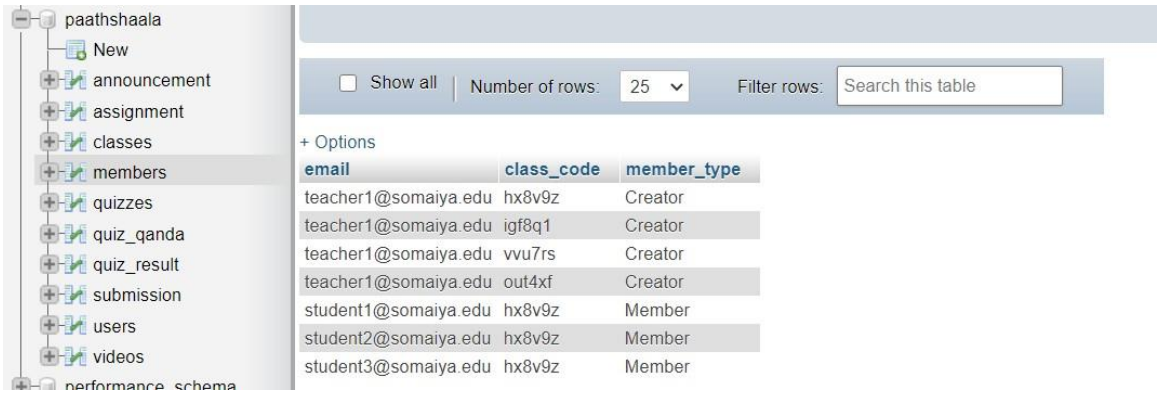


Image 50: Database table 'members'

Table 2: users

Image 51: Database table 'users'

Table 3: classes

+ Options

	class_code	class_name	class_creator	class_creation_date
Edit Copy Delete	hx8v9z	Class 1: Exploratory Data Analysis	teacher1@somaiya.edu	09-04-2021
Edit Copy Delete	igf8q1	Class 2: Object Oriented Software Engineering	teacher1@somaiya.edu	09-04-2021
Edit Copy Delete	out4xf	Class 4: Cloud Computing	teacher1@somaiya.edu	09-04-2021
Edit Copy Delete	vvu7rs	Class 3: Simulation and Modelling	teacher1@somaiya.edu	09-04-2021

Check all *With selected:* Edit Copy Delete Export

Image 52: Database table 'classes'

Table 4: quizzes

+ Options

	quiz_code	quiz_creator	subject	number_of_questions	number_of_options	class_code	create_date	date_validity
Edit Copy Delete	g6cc2l	teacher1@somaiya.edu	Subject 1	3	2	hx8v9z	2021-04-10	2021-04-16
Edit Copy Delete	tfe0mg	teacher1@somaiya.edu	Subject 3	2	3	hx8v9z	2021-04-09	2021-04-16
Edit Copy Delete	zh9l61	teacher1@somaiya.edu	Subject 2	2	2	hx8v9z	2021-04-09	2021-04-24

Check all *With selected:* Edit Copy Delete Export

Image 53: Database table 'quizzes'

Table 5: quiz_qanda

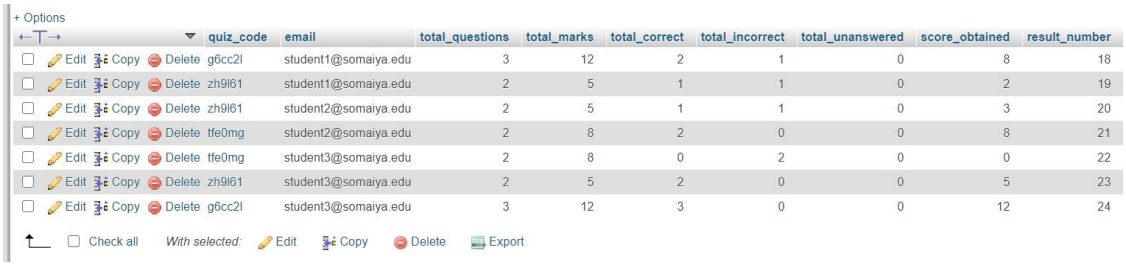
+ Options

	q_id	quiz_code	question	a_1	a_2	a_3	a_4	a_5	a_6	correct_answer	marks
Edit Copy Delete	26	zh9l61	abcde	1	2	NULL	NULL	NULL	NULL	1	2
Edit Copy Delete	27	zh9l61	abc	1	2	NULL	NULL	NULL	NULL	1	3
Edit Copy Delete	28	tfe0mg	abc	1	2	3	NULL	NULL	NULL	1	5
Edit Copy Delete	29	tfe0mg	xyz	1	2	3	NULL	NULL	NULL	1	3
Edit Copy Delete	30	g6cc2l	Is Delhi the capital of India?	True	False	NULL	NULL	NULL	NULL	True	3
Edit Copy Delete	31	g6cc2l	O+ve blood group is universal donor?	True	False	NULL	NULL	NULL	NULL	True	4
Edit Copy Delete	32	g6cc2l	Who is the current finance minister of India?	Nirmala Sitharaman	P. Chidambaram	NULL	NULL	NULL	NULL	Nirmala Sitharaman	5

Check all *With selected:* Edit Copy Delete Export

Image 54: Database table 'quiz_qanda'

Table 6: quiz_result



+ Options

	quiz_code	email	total_questions	total_marks	total_correct	total_incorrect	total_unanswered	score_obtained	result_number
Edit Copy Delete	g6cc2l	student1@somaiya.edu	3	12	2	1	0	8	18
Edit Copy Delete	zh9l61	student1@somaiya.edu	2	5	1	1	0	2	19
Edit Copy Delete	zh9l61	student2@somaiya.edu	2	5	1	1	0	3	20
Edit Copy Delete	tfe0mg	student2@somaiya.edu	2	8	2	0	0	8	21
Edit Copy Delete	tfe0mg	student3@somaiya.edu	2	8	0	2	0	0	22
Edit Copy Delete	zh9l61	student3@somaiya.edu	2	5	2	0	0	5	23
Edit Copy Delete	g6cc2l	student3@somaiya.edu	3	12	3	0	0	12	24

Check all With selected: Edit Copy Delete Export

Image 55: Database table ‘quiz_result’

Table 7: assignment

+ Options

	title	description	marks	duedate	email	date	time	assignid	class_code
Edit Copy Delete	Assignment 3	This is assignment 3	100	2021-04-23	teacher1@somaiya.edu	2021-04-10	02:42 PM	k1k0i1	hx8v9z
Edit Copy Delete	Assignment 2	This is assignment 2	50	2021-04-17	teacher1@somaiya.edu	2021-04-10	02:42 PM	t1ji7n	hx8v9z
Edit Copy Delete	Assignment 1	This is the first assignment of the Class!	25	2021-04-15	teacher1@somaiya.edu	2021-04-09	11:55 PM	ympy20	hx8v9z

Check all With selected: Edit Copy Delete Export

Image 56: Database table ‘assignment’

Table 8: submission

+ Options

	class_code	assignid	file_name	email	marks	date	time	subid	status
Edit Copy Delete	hx8v9z	ympy20	uploads/9f99969801d07b87fbd21abcc745bcbe.docx	student1@somaiya.edu	15	21-04-10	02:44 PM	qrl57f	Turned On Time
Edit Copy Delete	hx8v9z	ympy20	uploads/b41e9fe08b42d89bae2168c5df61da37.docx	student2@somaiya.edu	NULL	21-04-10	03:06 PM	xkwyrj	Turned On Time

Check all With selected: Edit Copy Delete Export

Image 57: Database table ‘submission’

Table 9: announcement

+ Options

	description	email	date	time	annid	class_code
Edit Copy Delete	Welcome to the Class! This is the first announceme...	teacher1@somaiya.edu	2021-04-09	11:58 PM	cvh5c9	hx8v9z
Edit Copy Delete	This is the second announcement of the class!	teacher1@somaiya.edu	2021-04-09	01:00 AM	kthvif	hx8v9z

Check all With selected: Edit Copy Delete Export

Image 58: Database table 'announcement'

Table 10: videos

+ Options

	video_id	file_name	email	date	time	class_code	description
Edit Copy Delete	5	uploads/f9efb20151eed3167ce5f0e5be79079f.mp4	teacher1@somaiya.edu	09-04-21	12:01 AM	hx8v9z	Lecture 1: Introduction Class

Check all With selected: Edit Copy Delete Export

Image 59: Database table 'videos'

CHAPTER 4

Results and Discussion

By developing this website, we were successfully able to create an interface which can be customized according to the member type which is either student or teacher. On the teacher dashboard teacher will be able to create and join class along with profile and logout options. Under class, he/she will be able to create assignments, make announcements, upload lecture videos and create a quiz. Teachers will also get the option to view and grade all the submissions under each assignment. In this way using this interface teacher will be able to successfully collaborate with students. The student on signing in has options to join class, view profile, update password on student dashboard. For each class the student has joined, he/she can attempt quizzes, submit assignments, view or download lectures and view announcements posted by the teacher in that classroom. Students can also view the marks and monitor the performance by looking at the graphs displayed in each classroom. Thus, the project was successfully implemented with the above-mentioned features.

CHAPTER 5

Conclusions and Learning

5.1 Conclusion

During the challenging times of the COVID 19 Pandemic, we realized a need for a unified Learning Management System for online education in our country. This thought inspired us to design a web application “PATHSHALA”, to solve the problem for the mode of online education. We came forward putting all the skills we have learnt up till the 5th semester to use to design this web application. In this project we have tried to include the programming skills learnt in the subject Web Programming I, Web Programming 2, Python Programming, Database management Systems, Advanced Databases Information and Network Security, Data Structures etc… The web application we have created provides the students a medium to continue their education smoothly in the online mode, where they can be a part of dynamic activity classrooms.

Our application “PATHSHALA” allows any organization to develop electronic coursework, deliver it with unprecedented reach and flexibility, and manage its continued use over time. It allows the education system to:

I. Create classes
II. Enroll students in classes
III. Organize the content into uploaded video lectures.
IV. Deliver the content (to students or other staff members)
V. Dynamic Interaction between faculty and students using assignments, announcements and quizzes.

5.2 Scope for Future Work

As for future that is imminent the system can be refined by enriching it with more functionalities such as the ability for teachers to comment on students work for an assignment. One of the toughest challenge online mode of education faces is about the examination, to conduct them without any malpractices. In our scope we have included MCQ quiz type examination, but would like to brainstorm over how we can create an examination module, to conduct hassle free and smooth examination experience both for the faculty and the students, working in the online mode. Having the ability to schedule lectures and online meet within the Learning Management System. Giving the students and teachers to sign up with their already existing Google or Microsoft Account, without the need to enter personal details. The system could also integrate a system wherein students can view other students who have enrolled in the same class and can communicate with each other like any chat app. The system can also have a calendar showing all student deadlines, timing of various lectures so the student is always informed and can plan his/her day accordingly. Lastly for future project building the system can have an inbuilt plagiarism checker or an API to a plagiarism website to check the originality of the document submitted by the student to the teacher.

5.3 Learning

From this project, we learned several technologies such as html, css, bootstrap, php, python and MySQL. Using these technologies, we were able to effectively create a working website of learning management system named as ‘Paathshala’. We were able to gain an in-depth knowledge about the implementation of each of these languages and technologies and learned about error handling. We were able to think about different test cases considering each and every scenario and successfully implemented those features. By doing this project we not only gained technical skills, but we were also able to improve our soft skills such as planning, communication and teamwork

REFERENCES

[1] https://getbootstrap.com/docs/4.1/getting-started/introduction/

[2] https://stackoverflow.com/questions/18339961/md5-hashes-from-string-dont-match-up

[3] https://stackoverflow.com/questions/19735250/running-a-python-script-from-php

[4] https://developers.google.com/chart

[5] https://stackoverflow.com/questions/16102809/how-to-upload-large-files-above-500mb-in-php

[6] https://stackoverflow.com/questions/19735250/running-a-python-script-from-php

[7] https://dev.mysql.com/doc/refman/8.0/en/order-by-optimization.html

[8] https://www.geeksforgeeks.org/add-google-charts-webpage/

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