Applied Information Technology And Computer Science Vol. 3 No. 2 (2022) 118-133
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AITCS

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/aitcs
e-ISSN :2773-5141

Adami Tuition Centre Management System Using AES Encryption and CAPTCHA

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DOI: https://doi.org/10.30880/aitcs.2022.03.02.008
Received 07 October 2022; Accepted 09 October 2022; Available online 30 November 2022

Abstract: Many tuitions centre or franchisees still use a manual record management system to maintain personal records of their students and tutor, or any other paper documents in their business environments, despite the fact that we live in a digital age. The management system discussed in this project is focused on the educational centre. The person in charge of management tasks, such as admin, management, is the user of this system. This system has the potential to organize and safeguard large amounts of data while also reducing the use of paper. Using database and web-based application used to manage all of the tasks. For security perspective, AES encryption, reCAPTCHA and QR code for attendance is used to protect confidentiality for users. The tutor and student of database elements can result in more structured data in the system. This system operates in a client-server model. It is a web-based programmed that requires the use of an internet browser to function. This tuition management system will reduce the inefficient method now in use. This system can serve as a vehicle for expressing the planning, analysis, design, implementation, and testing of this system.

Keywords: Web-Based, Client-Server Mode, Management, AES, QR code, reCAPTCHA

1. Introduction

This project uses a web-based application concept to facilitate the management system in educational institutes. It uses the most reliable way of uniquely identifying students through this web application. Such type of web application is very useful in tuition center for daily attendance, register class and subject, upload homework and timetable. This project enables the easy way of maintaining tuition management system with fewer efforts.

As we can see now, the registration form, attendance report and homework submission are kept in form of paper. This is not a systematic method where the form or document can be lost and may be damaged. The staff also must put the form in any files or folders that it needs some spaces to put in rack or cabinet.

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The major goal of this project is to design Tuition Management System for Adami Tuition Centre Using 256-bit AES Security, to develop the proposed system Web Based Platform and to test the speed and accuracy of the Tuition Management System

2. Related Work

2.1 Learning Centre Management System

The Learning Management System, or LMS as it is called in the higher education sector, is an online gateway that links teacher and students. It allows students to effortlessly exchange resources or activities from the classroom. It's also a platform that allows lecturers and students to connect outside of the classroom, through forums.[1]

The Learning Centre Management System is a stand-alone programmed that runs on a Windows platform. MySQL was utilized as the database in this system.

2.2 Advance Encryption Standard (AES)

AES is built on a substitution-permutation network design approach, which combines both substitution and permutation, and is fast in both software and hardware. AES does not use a Feistel network, unlike its predecessor DES. AES employs the Rijndael cypher, which has a constant block size of 128 bits and a key size of 128, 192, or 256 bits, and is defined in three rounds: 10, 12, and 14. In AES, three processes are carried out that are Encryption, Decryption and Key generation.

2.3 CAPTCHA

Google's reCAPTCHA is a free service that protects websites against spam and abuse. A "CAPTCHA" is a turing test used to distinguish between humans and bots. It's simple for people to figure out, but difficult for "bots" and other harmful software. Restrict automated software while allowing welcome users to enter with ease by adding reCAPTCHA to a site.

2.4 Authentication

The process of authenticating who is on the other end of the link is known as authentication. When two devices form a connection, the authentication procedure begins. It works on the challenge-response principle. The verifier issues a random number-based challenge to the other device. The two devices must share a secret key for the authentication procedure to work. During the pairing process, this key was generated. The pairing procedure is started if they do not share a secret key. [2]

The use of two-factor authentication to control access to sensitive systems and data has been around for a long time. Online service providers are increasingly utilizing two-factor authentication (2FA) to secure their users' credentials from hackers who have stolen a password database or obtained user passwords through phishing efforts.[3]

2.5 Database

There are numerous different types of databases, each with its own set of data model and vendor peculiarities. When it comes to the distinctions between data models, each has its own data representation and accompanying manipulation. The table type of relational databases (RDB), the XML-representation type of XML databases (XMLDB), and object-oriented databases are all common instances (OODB) [4] . Even among manufacturers, the same model database may have distinct functionalities. MySQL, which is a good example.

2.6 Study on Existing System

The proposed system and existing system such as TuitionPost and SimTrain are all compared in Table 1. This table compare the features each system has such an admin login, student login, registration, timetable management, daily attendance, employee management, 2 factors authorization, and reports.

Table 1: Comparison of Existing System

Features	TuitionPost	SimTrain	My System
Admin Login	Yes	Yes	Yes
Student Login	Yes	No	Yes
Registration	Yes	Yes	Yes
Timetable Management	No	No	Yes
Daily Attendance	Yes	No	Yes
Tutor Management	No	No	Yes
2 Factors Authentication	No	No	Yes
Reports	Yes	Yes	Yes

3. Methodology/Framework

The Systems Development Lifecycle (SDLC) is a project management conceptual model that explains the processes of an information system development project, from early feasibility to final product maintenance [5]. The SDLC is a technique developed to guarantee that systems are built and executed in a systematic, logical, and step-by-step manner as in Table 2. System definition, physical design, and implementation are the three core processes that all SDLCs have in common [6].

Table 2: System Development Life Cycle Phase

Phase	Activities
Planning	• Investigate and verify problem. • After receiving clearance from supervisors, submit a proposal for a project title and begin writing the project's introduction. The project history, problem description, objective, scope, project importance, projected output, and conclusion are all included in the introduction. • Describe the project's needs, including software, hardware, and any other associated requirements.
Analysis	• Analyze the problem and end-user information requirements. • Define and fine-tune data and functionality of the system. • The functions that will be provided will be completely reengineered in terms of business processes. • Detailed data and process models should be developed. • Define data requirements, functional requirements, non-functional requirements, and additional requirements in the requirement analysis.
Design	• Several charts and diagrams are generated to graphically represent the business logic. This project examines, builds, and redefines context diagrams, data flow diagrams (DFD), and entity-relationship diagrams (ERD)[7].
Implementation and Testing	• Run the codes and queries • Execute the test. Including design testing, data testing. Get result of errors, bugs and faults and interface.
Maintenance	• The faults or bugs detected during testing will be identified and fixed in order to eliminate any errors or bugs that prohibit the right functioning and have failed to meet the expected behavior expectations. The rectified functions, interfaces, or modules are then re-tested to verify that any mistakes or defects discovered have been addressed and that the solutions released will not create any new errors, bugs, malfunctions, or difficulties in other functions, interfaces, or modules.

3.1 Iterative Waterfall Methodology

Many project initiatives use a waterfall method, in which discovery is followed by design, which influences implementation, validation, and closeout. Each of these phases is usually done just once in a project, with little iteration. This is the "archetypal project cycle model" from which all others are formed, according to the standard project management technique [8].

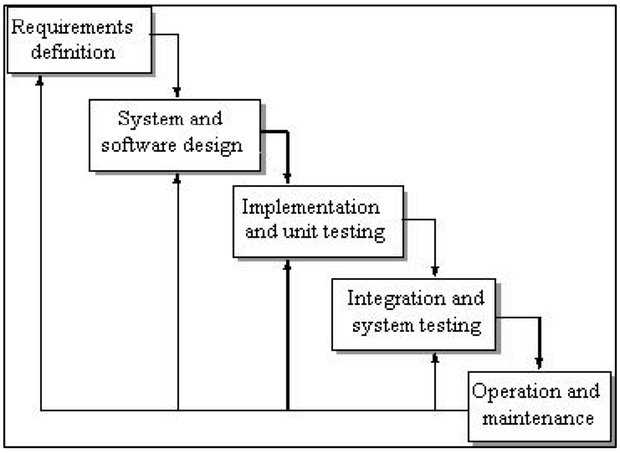

Requirements definition
System and software design
Implementation and unit testing
Integration and system testing
Operation and maintenance

Figure 1: Iterative Waterfall Model [9]

The iterative waterfall model as in Figure 1 is a modification of the traditional waterfall model that makes it more applicable to real-world software development initiatives. With a few adjustments to boost the effectiveness of software development, it is nearly identical to the traditional waterfall paradigm. The primary distinction between the iterative waterfall model and the traditional waterfall model is the provision of feedback channels from each step to its predecessor phases. When working on actual projects, stages may overlap to save time and effort. The iterative waterfall model believes that one phase can begin after the previous phase is finished.

3.2 Design Phase

The primary function of design is to process and communicate information. Planning the information flow would result in a significantly more efficient design process. Mapping the information flows between designers would aid in comprehending the design process. DFD is an appropriate technique for modelling the design system because it is composed of processes connected by interfaces[10]. Table 3 shows the proposed system’s functional requirement.

Table 3: The proposed system’s functional requirement

No.	Modules	Function	User
1.0	Registration Module	• Enable user to create a new account by entering personal information • Display message if the user has any invalid input • Display message the user if registration is successful	• Student • Parent • Tutor
2.0	Login Module	• User can log in with username and password with associated database record • The system will send authentication code in email • After a successful login, the program should redirect users to the dashboard.	• Admin • Tutor • Student • Parent
3.0	Manage user data record module	• The system allow user to input, edit and update.	• Tutor • Student • Parent

Table 3: (cont)

4.0	Manage Subject	• User can choose the subject • User can add, update and delete for the chosen subject	• Student
5.0	Manage Class	• System allows to view list of classes	• Tutor
6.0	Manage Timetable	• The system shall enable the user to create the tuition center's schedule. • The system shall enable the user to delete the tuition center's schedule.	• Admin
7.0	Manage Attendance	• User generate QR Code • User allowed to scan attendance using QR Code • User allowed to take information from another user	• Tutor • Student
8.0	Record Payment	• System display student payment details • System display tutor wages and overtime payment • System display summary payment	• Admin
9.0	View Homework	• User generate homework assignment • User allowed to upload homework in the system	• Tutor • Student
10.0	Report	• System display report monthly	• Admin

3.3 Non-Functional Requirement Analysis

i) Security Requirement

The functional requirement specifies the security needs for software. The system enables authorized users to log in and perform system functions. The system verifies the user login credentials entered by users against any database record.

ii) Interface Requirement

Aesthetically pleasing interface that is presented for the user.

iii) Performance Requirement

For users, the website's load time should not exceed two second. The system must be available 24 hours a day.

iv) Reliability

The system performs without failure for 1000 user below.

v) Data Integrity

The system makes sure data integrity by periodically backing up all database updates for each record transaction.

3.4 Data Analysis and Design

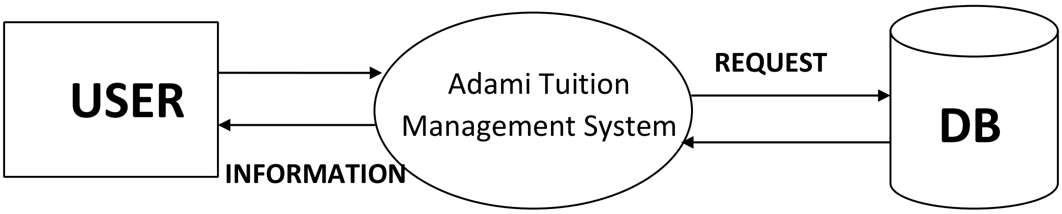


Figure 2: Data Flows Diagram

Figure 2 shows the data flows diagram for Adami Tuition Management System. The user will access to system and the system will request for database and return with information through system and to user.

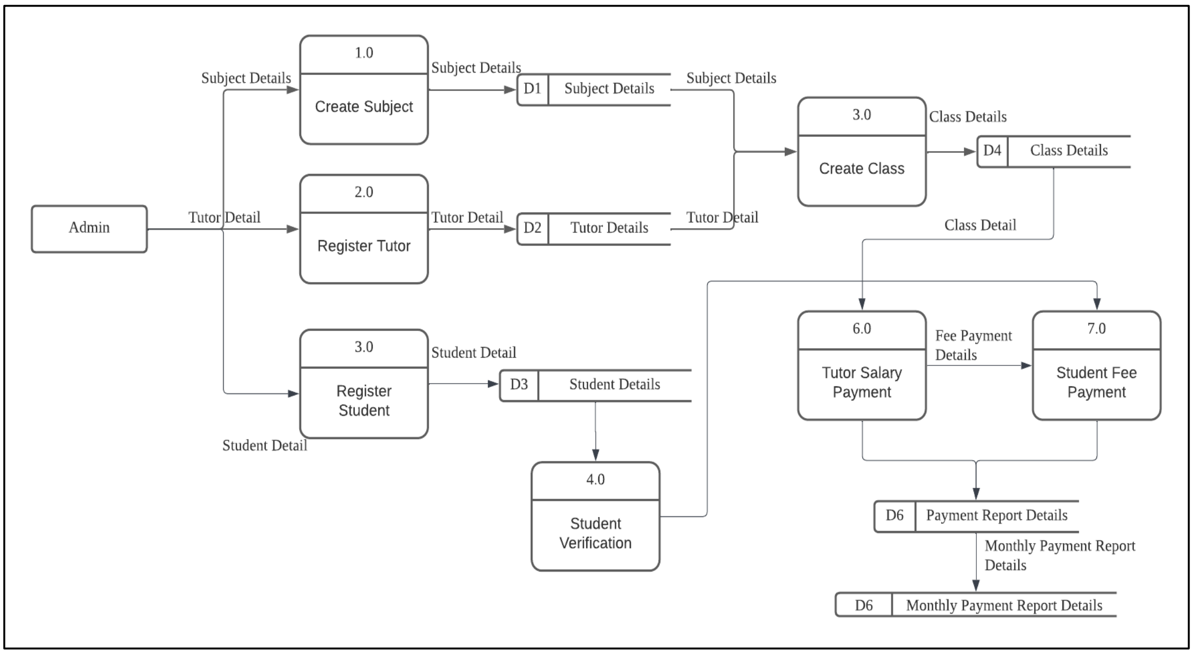


Figure 3: DFD Level 1

Figure 3 shows the DFD Level 1 for the system. For admin need to create subject and the subject will be stored in database subject details. Tutor needs to register tutor details and stored in tutor details database. With subject and tutor, tutor can create class with their details. It will be included in database and generate tutor salary payment and student fee payment. With fee payment details, the system can create payment report details and stored in monthly payment report details. Students need to register their details and stored in student details database. Student must pass the verification for student fee payment. Figure 4 shows the class diagram of the Adami Tuition Management System.

3.5 Implementation Phase

The output from the previous step that has been developed will be tested for functionality in this phase. After testing each module, all the modules built during the implementation phase are incorporated into the system. Each module's whole coding will be checked against the functional and non-functional requirements. Its purpose is to check for errors in the module's created code and to adhere to the standards. If there is an issue with the module design, it must be reverted to the system design, then recoded till the problem is resolved, then tested for functionality again.

3.6 Testing Phase

The purpose of the testing phase is to confirm that the fully completed proposed system can perform properly in accordance with the functional and non-functional requirements identified during the analysis and design phase. The Adami Tuition Management System is put through alpha and beta testing to see if it fits the functional requirements and the demands of the users. Furthermore, testing the suggested system is necessary to ensure that it can do the tasks required in real-world circumstances.

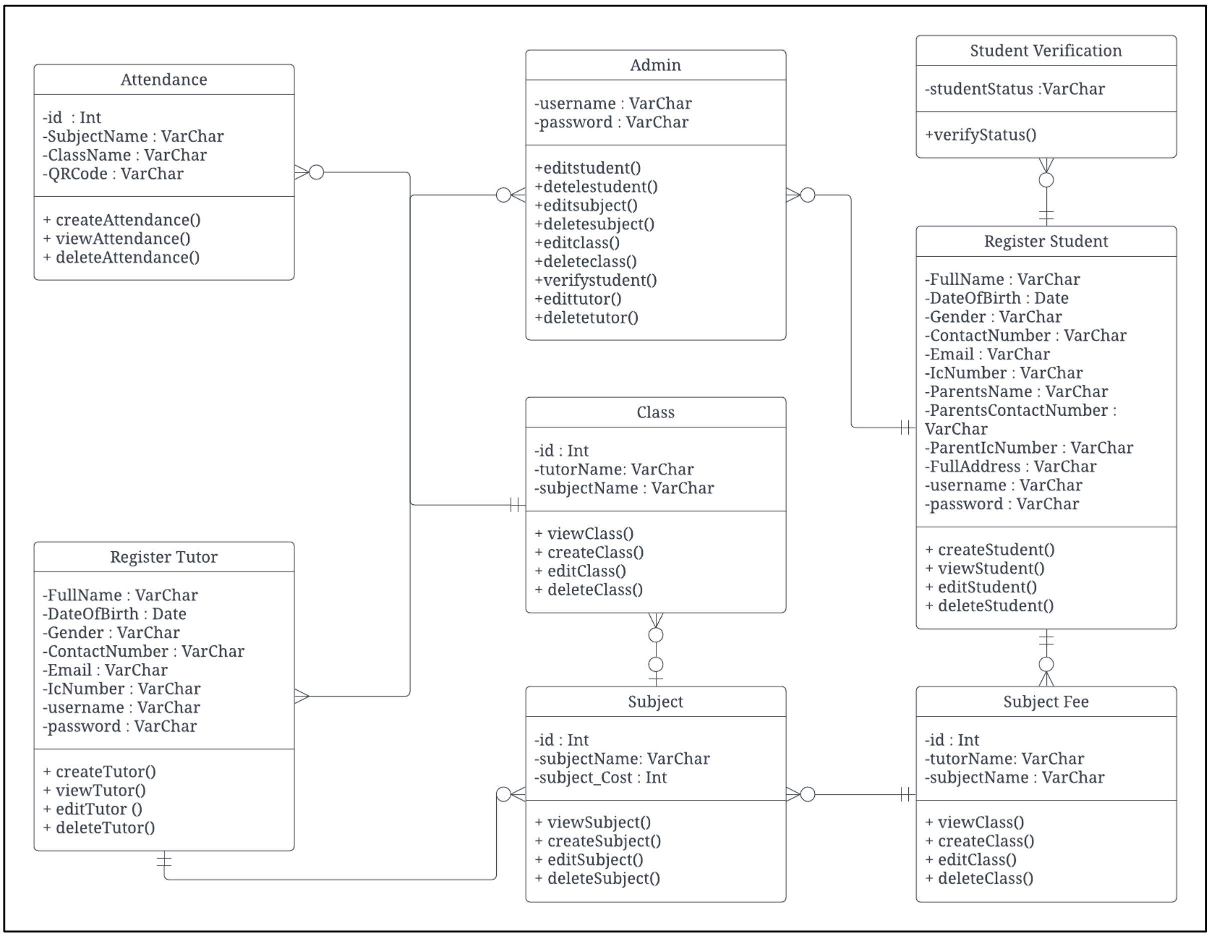


Figure 4: Class Diagram

4. Result and Discussion

This section discusses the system interface in Adami Tuition Management System.

4.1 Admin Login Page

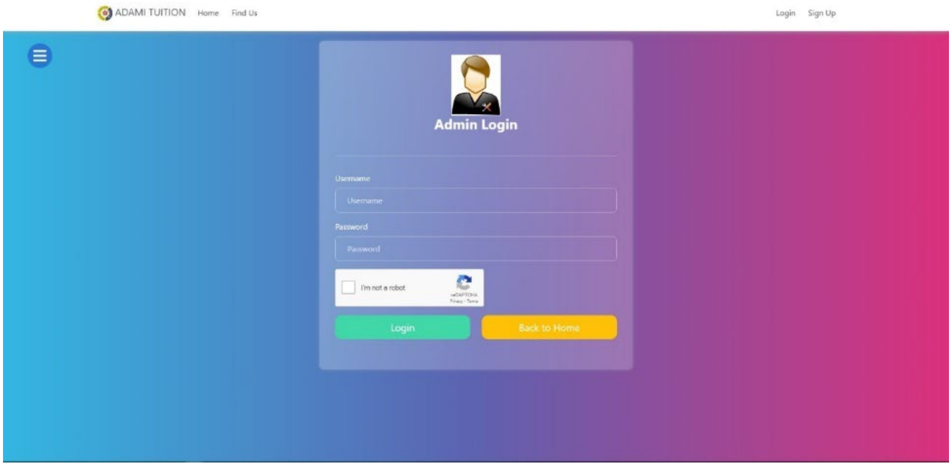


Figure 5: Admin Login Page

Figure 5 shows the Admin Login page. To login, the administrator must enter a username and password. To successfully login as an admin, the admin must check the "I'm not a robot" CAPTCHA.

4.2 Student Registration Page

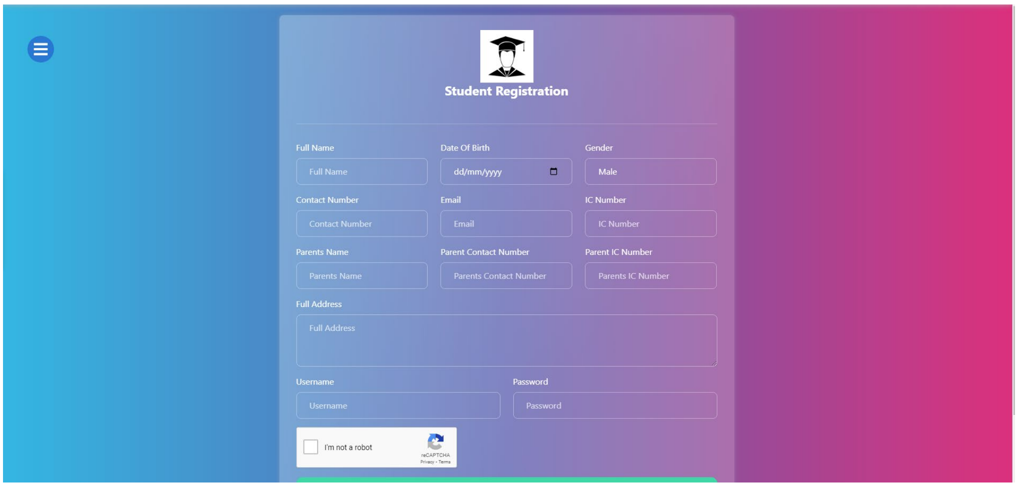


Figure 6: Student Registration Page

To register as a student, students must fill out a registration form as shown in Figure 6. After entering all the information, students must complete the "I'm not a robot" CAPTCHA to complete the registration process.

4.3 Tutor Registration Page

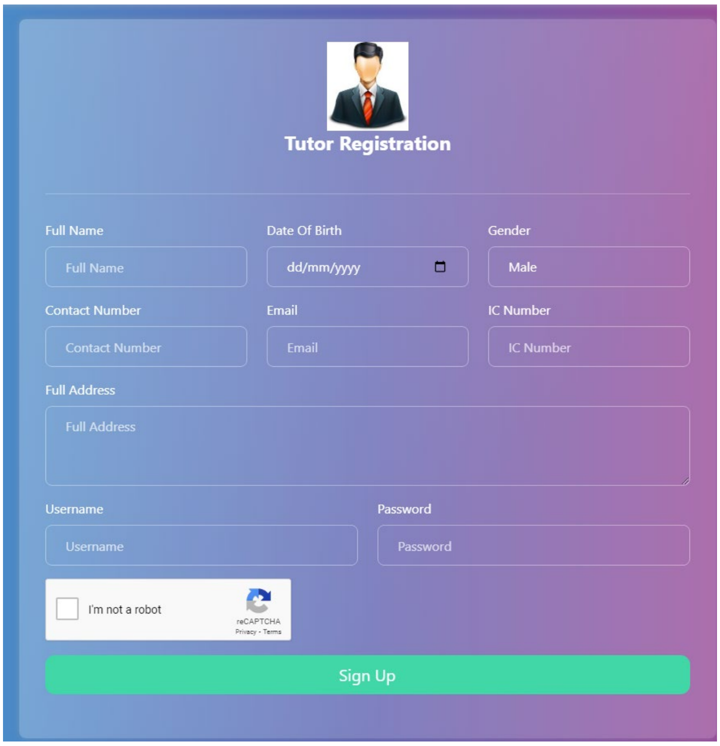


Figure 7: Tutor Registration Page

To register as a tutor, tutor must fill out a registration form as in Figure 7. After entering all the information, tutor must complete the "I'm not a robot" CAPTCHA to complete the registration process.

4.4 Student Login Page

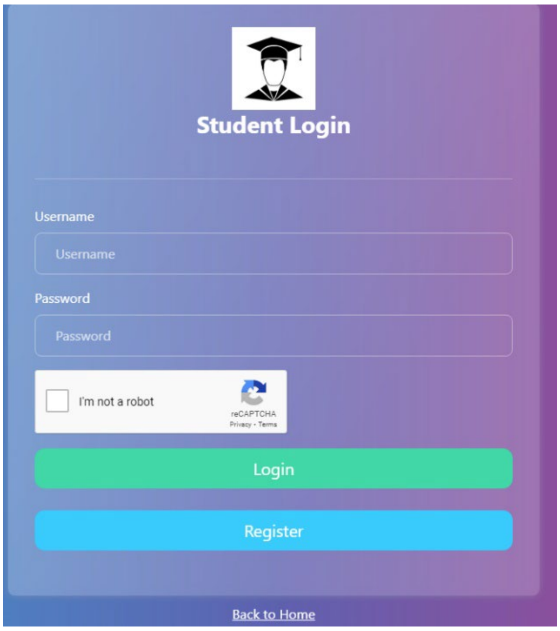


Figure 8: Student Login

To login, the student must enter a username and password as display in Figure 8. To successfully login as a student, the student must check the "I'm not a robot" CAPTCHA.

4.5 Tutor Login Page

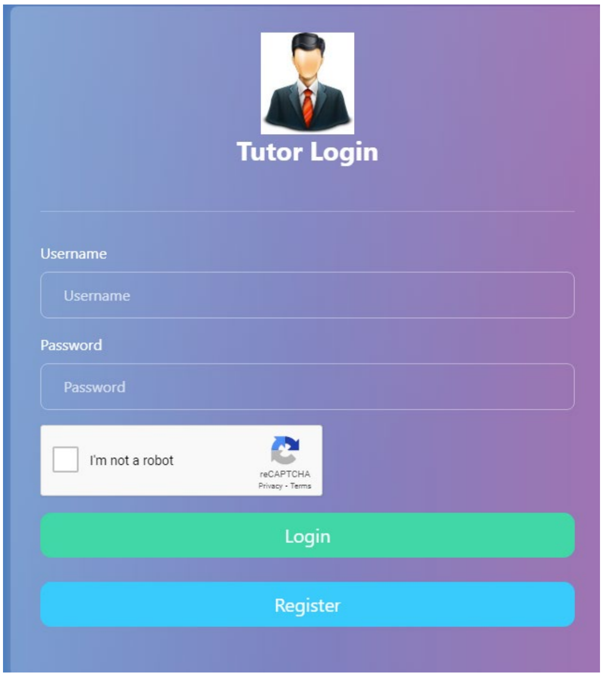
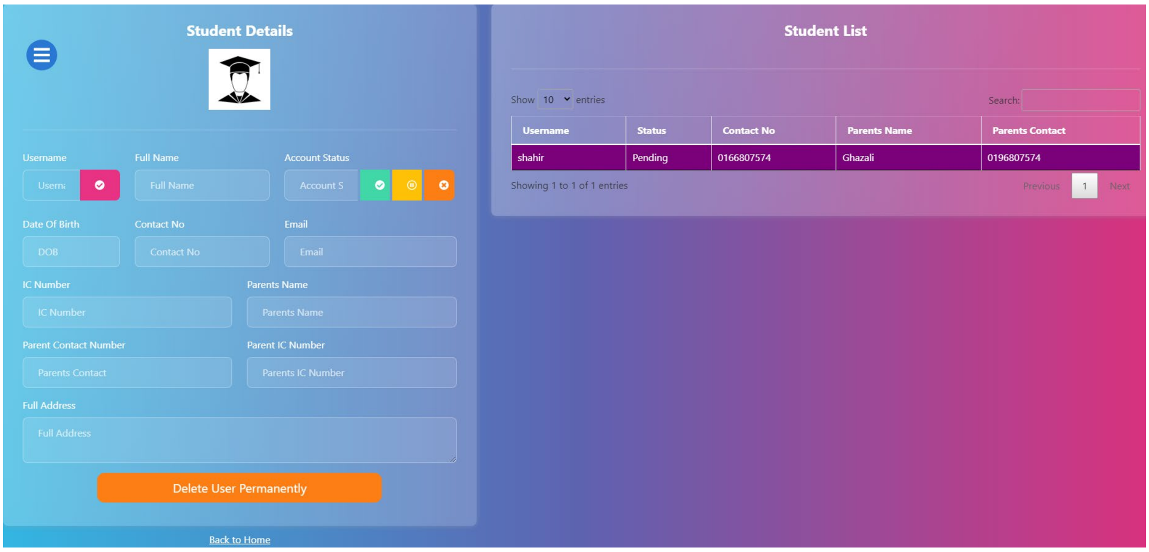


Figure 9: Tutor Login Page

To login, the tutor must enter a username and password as in Figure 9. To successfully login as an tutor, the tutor must check the "I'm not a robot" CAPTCHA.

4.6 Student Verification Page



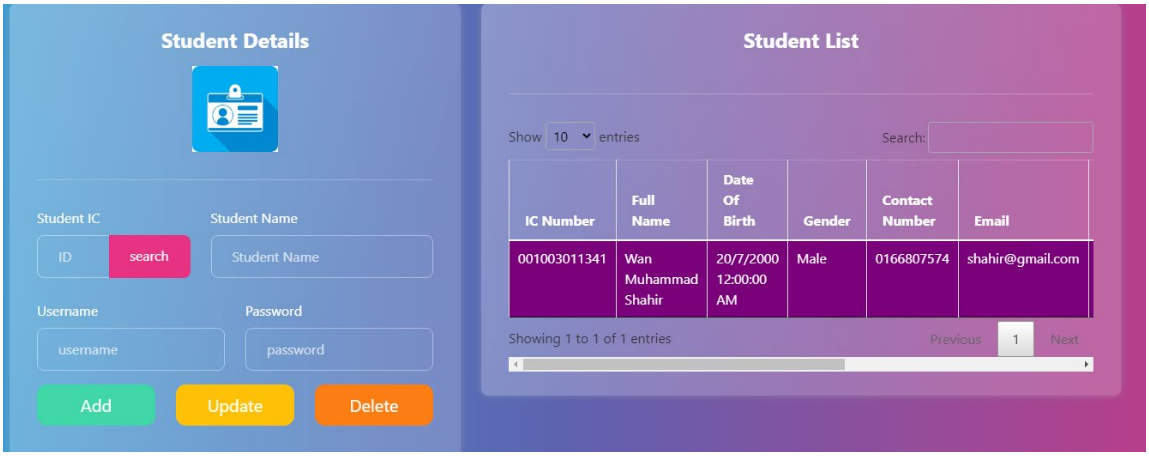
Username	Status	Contact No	Parents Name	Parents Contact
shahir	Pending	0166807574	Ghazali	0196807574

Showing 1 to 1 of 1 entries

Figure 10: Student Verification (Admin)

Figure 10 shows the student verification interface for admin page. To verify student, first we need to input username of the student. Table student list already on the right for reference. Tick button for verify the student status, pause button for pending student status and cross button for deactivate student. Lastly at the bottom, admin can delete user permanently.

4.7 Student Management Page



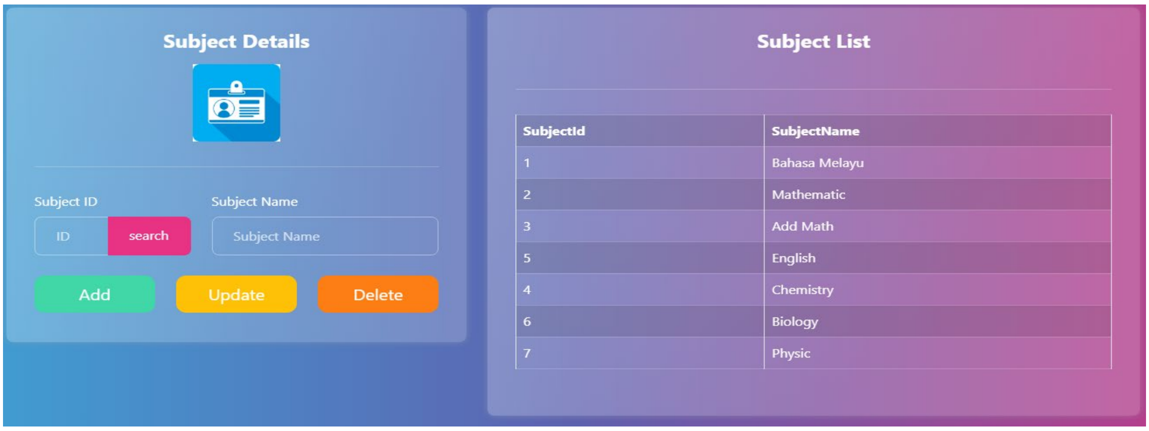
IC Number	Full Name	Date Of Birth	Gender	Contact Number	Email
001003011341	Wan Muhammad Shahir	20/7/2000 12:00:00 AM	Male	0166807574	shahir@gmail.com

Showing 1 to 1 of 1 entries

Figure 11: Student Management Page (Admin)

Admin needs to enter student IC as in Figure 11. Admin can change student name, username and password on update button. Admin can add student on add button. Admin can delete student using delete button.

4.8 Subject Management Page

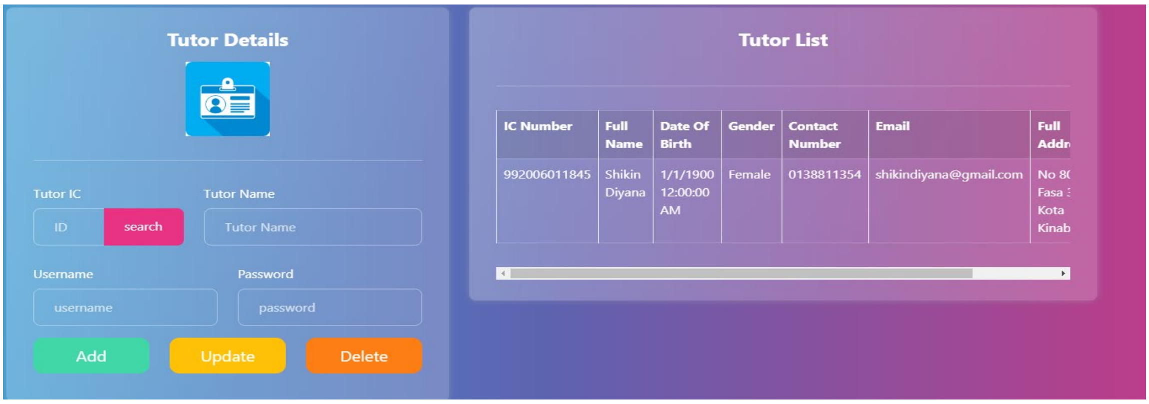


SubjectId	SubjectName
1	Bahasa Melayu
2	Mathematic
3	Add Math
5	English
4	Chemistry
6	Biology
7	Physic

Figure 12: Subject Management (Admin)

Admin can add subject using subject ID and subject Name using add button in Figure 12. Admin can update existing subject using update button. Admin can delete existing subject using delete button**.**

4.9 Tutor Management Page



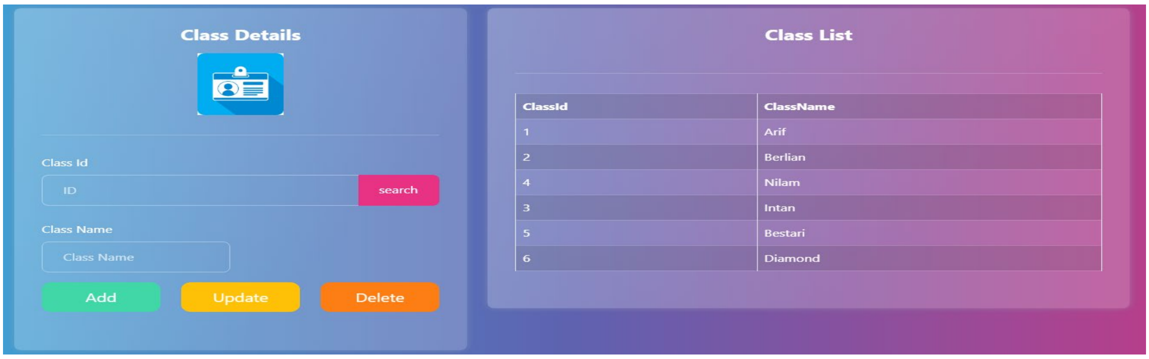
IC Number	Full Name	Date Of Birth	Gender	Contact Number	Email	Full Addr
992006011845	Shikin Diyana	1/1/1900 12:00:00 AM	Female	0138811354	shikindiyana@gmail.com	No 8(Fasa : Kota Kinab

Figure 13: Tutor Management (Admin) Page

Admin needs to enter tutor IC as in Figure 13. Admin can change tutor name, username and password on update button. Admin can add tutor on add button. Admin can delete tutor using delete button**.**

4.10 Class Management Page

Admin can add class using class ID and class Name using add button as shown in Figure 14. Admin can update existing class using update button. Admin can delete existing class using delete button.

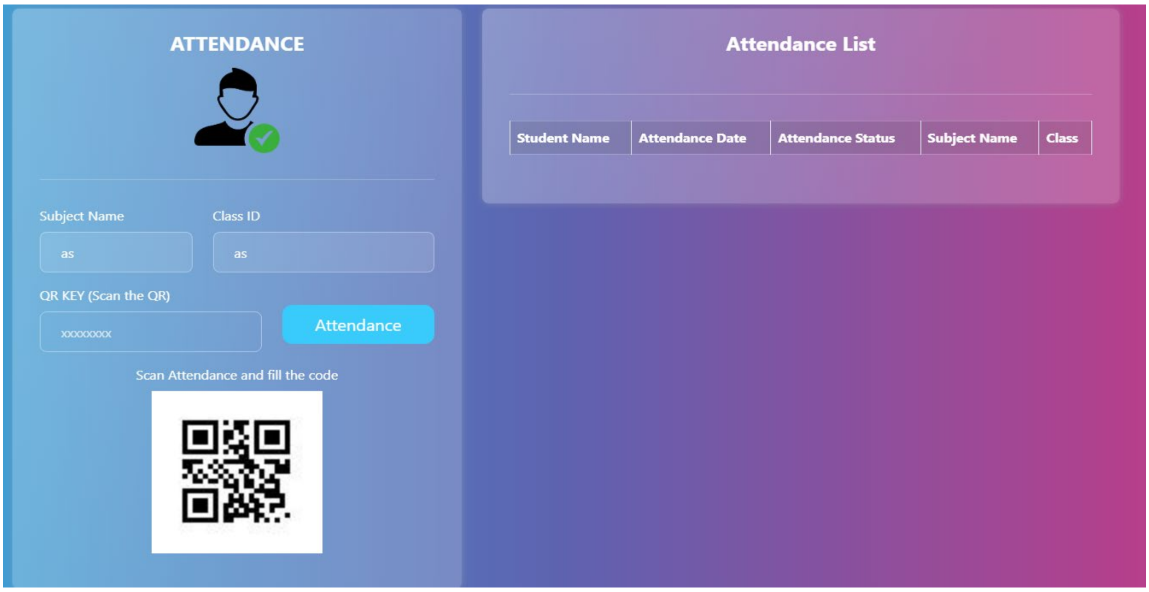


ClassId	ClassName
1	Arif
2	Berlian
4	Nilam
3	Intan
5	Bestari
6	Diamond

Figure 14: Class Management (Admin)

4.11 Attendance Page

Student can QR Code and get OTP code as shown in Figure 15. OTP code need to enter or QR Key box. Attendance box clicked to successfully attend the class.



ATTENDANCE

Subject Name: as

Class ID: as

QR KEY (Scan the QR): xxxxxxxx

Scan Attendance and fill the code

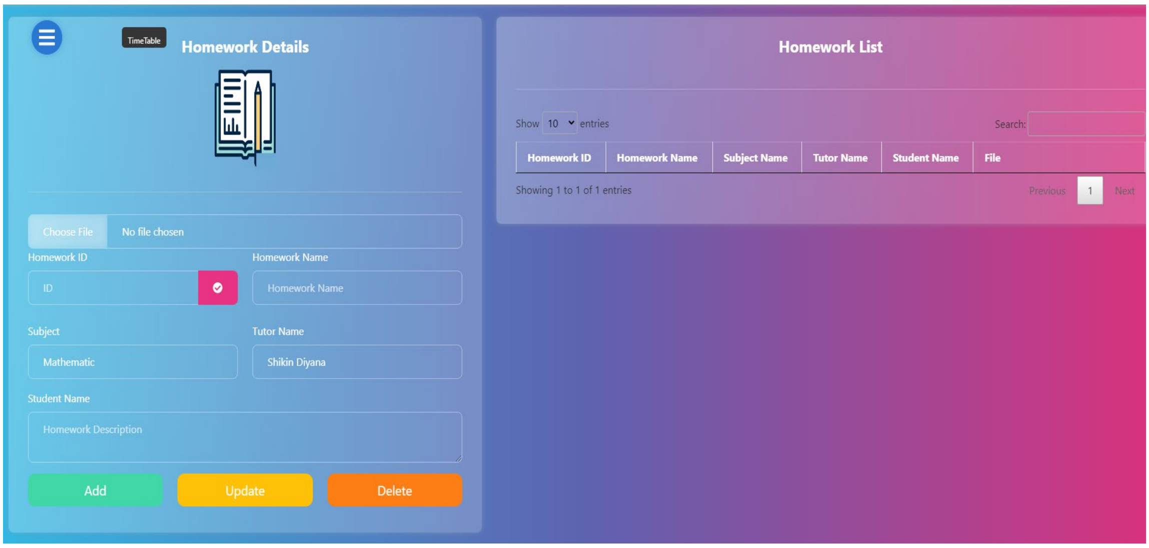
Attendance List

Student Name	Attendance Date	Attendance Status	Subject Name	Class

Figure 15: Attendance Page (Student)

4.12 Homework Page

Student can choose file for upload the homework as portray in Figure 16. Enter Id, homework name, subject, tutor name and lastly student name. Student can add homework using add button, update button to change specify file, id, homework name, subject and tutor name, delete button for deleting the homework.



Homework Details

Choose File No file chosen

Homework ID: ID

Homework Name: Homework Name

Subject: Mathematic

Tutor Name: Shikin Diyana

Student Name: Homework Description

Homework List

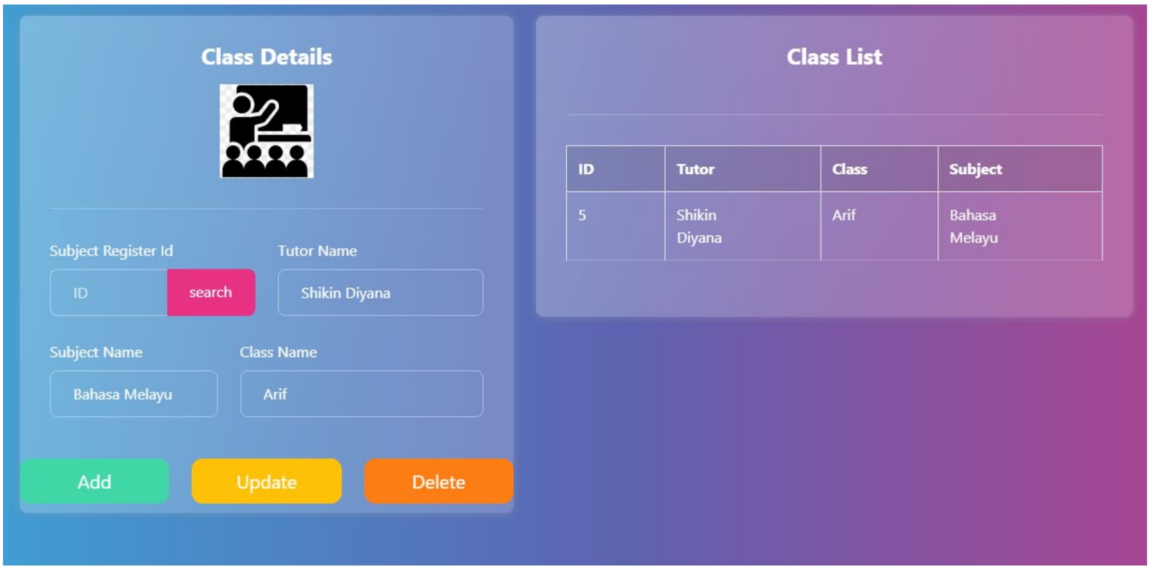
Show 10 entries Search:

Homework ID	Homework Name	Subject Name	Tutor Name	Student Name	File

Showing 1 to 1 of 1 entries

Figure 16: Homework Page (Student)

4.13 Register Class Page



Subject Register Id: ID

Tutor Name: Shikin Diyana

Subject Name: Bahasa Melayu

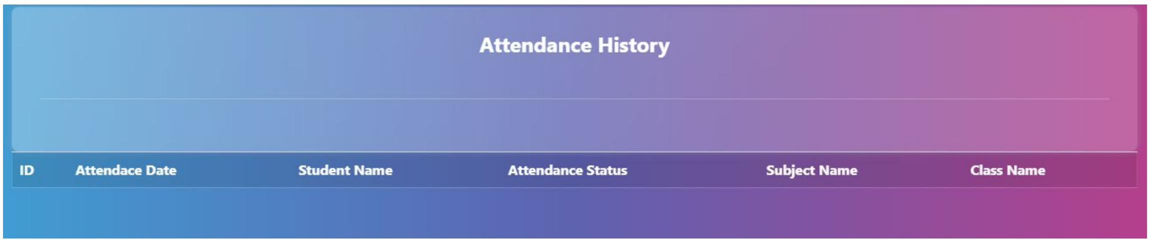
Class Name: Arif

ID	Tutor	Class	Subject
5	Shikin Diyana	Arif	Bahasa Melayu

Figure 17: Register Class Page (Student)

Student can register class using add button at the bottom but need to put id, choose tutor, subject and class as shown in Figure 17. Student can update specify class using id. Student can delete class using delete button.

4.14 Attendance History Page

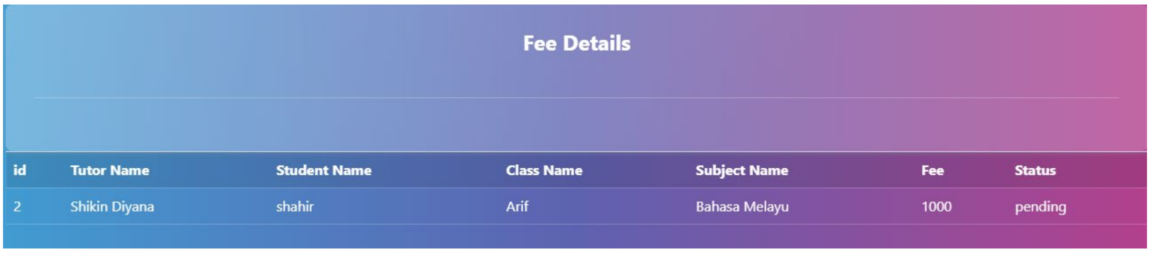


ID	Attendace Date	Student Name	Attendance Status	Subject Name	Class Name

Figure 18: Attendance History (Student)

In Figure 18, student can see their attendance history on the page such as id, attendance date, subject name, attendance status, subject name, and class name.

4.15 Fee Details Page

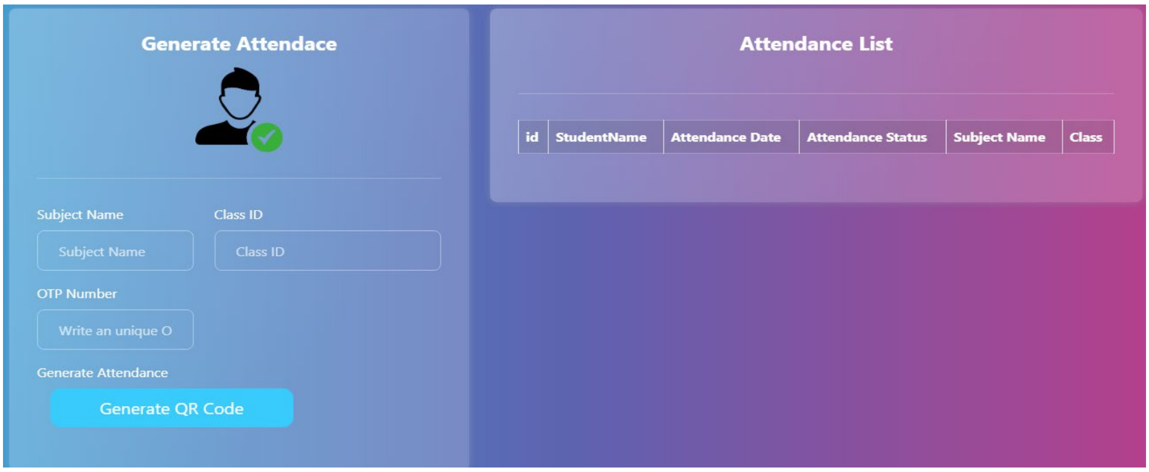


id	Tutor Name	Student Name	Class Name	Subject Name	Fee	Status
2	Shikin Diyana	shahir	Arif	Bahasa Melayu	1000	pending

Figure 19: Fee Details Page (Student)

Student can see their fee details as in Figure 19. Table contains id, tutor name, student name, class name, subject name, fee and status.

4.16 Fee Details Page

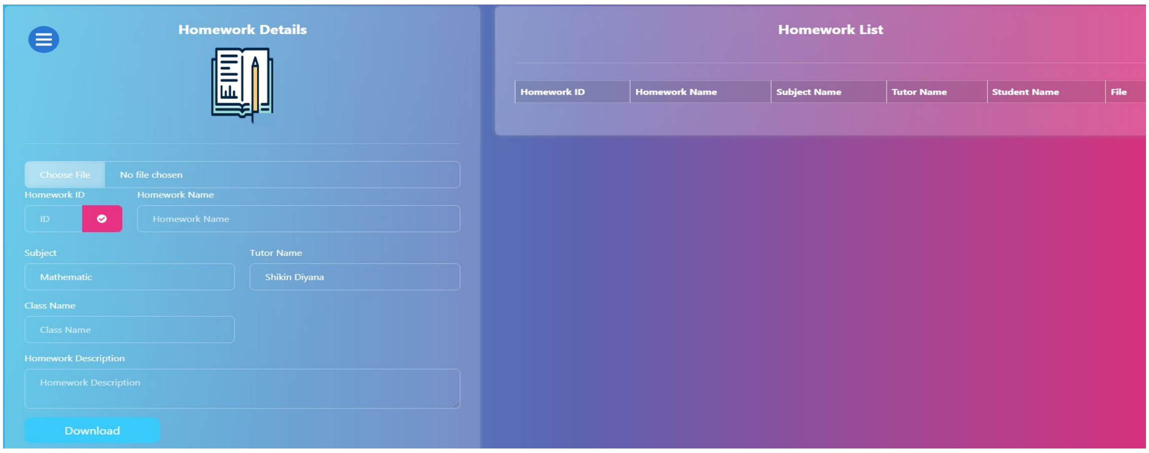


id	StudentName	Attendance Date	Attendance Status	Subject Name	Class

Figure 20: Generate Attendance (Tutor) Page

In Figure 20, tutor selects subject name, class id and enter OTP number to generate QR code. After pressing generate QR code button. The student can scan the QR code and get attendance.

4.17 View Homework Page



Subject: Mathematic

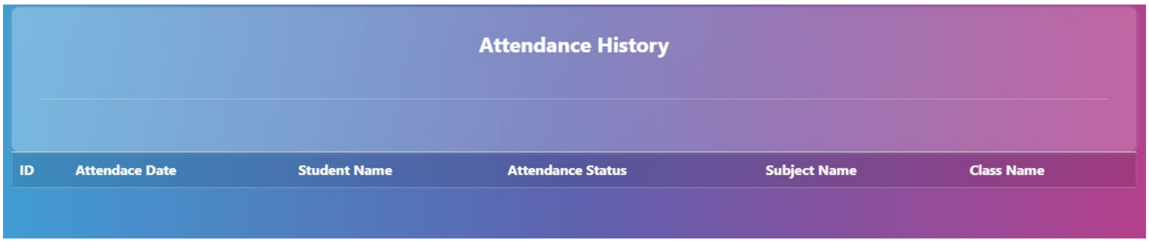
Tutor Name: Shikin Diyana

Homework ID	Homework Name	Subject Name	Tutor Name	Student Name	File

Figure 21: View Homework (Tutor) Page

In Figure 21, tutor can choose file for download the homework. Enter Id, homework name, subject, tutor name and lastly student name. Tutor can search homework using tick button.

4.18 Attendance History Page

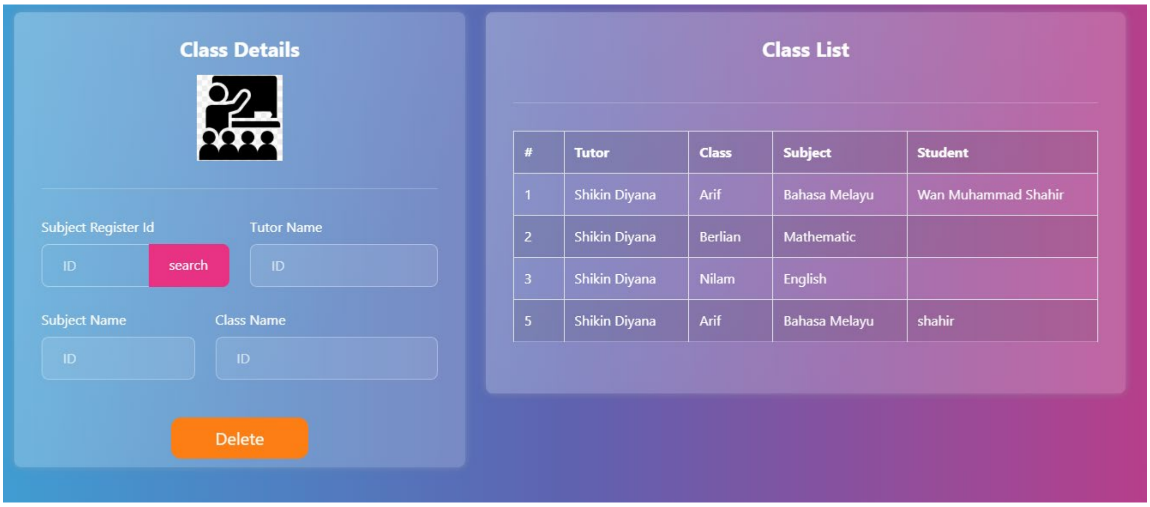


ID	Attendace Date	Student Name	Attendance Status	Subject Name	Class Name

Figure 22: Attendance History Page (Tutor)

Tutor can see their attendance history on the page such as id, attendance date, subject name, attendance status, subject name and class name as shown in Figure 22.

4.19 Class Detail Page

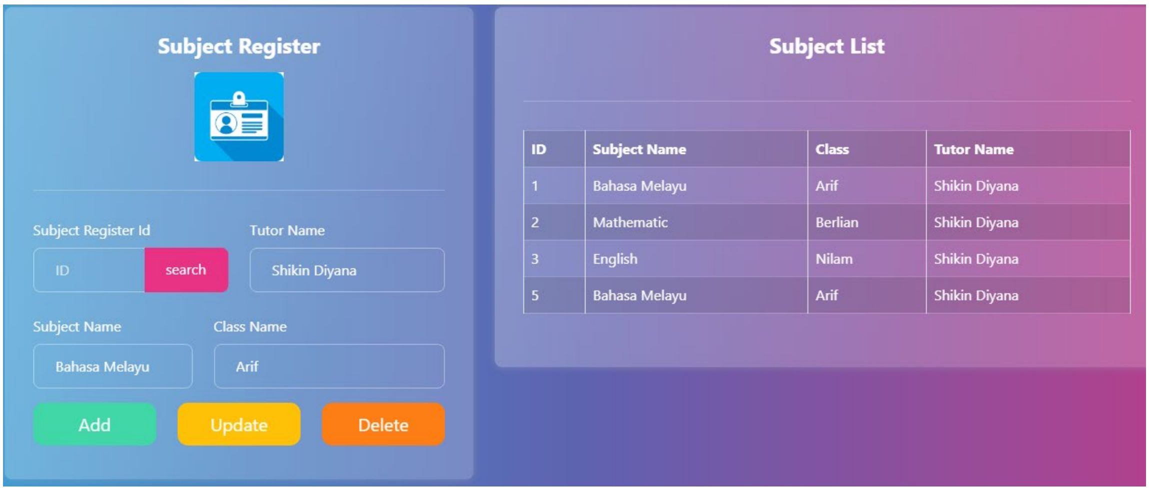


#	Tutor	Class	Subject	Student
1	Shikin Diyana	Arif	Bahasa Melayu	Wan Muhammad Shahir
2	Shikin Diyana	Berlian	Mathematic	
3	Shikin Diyana	Nilam	English	
5	Shikin Diyana	Arif	Bahasa Melayu	shahir

Figure 23: Class Details Page (Tutor)

In Figure 23, tutor can see their tutor’s name, subject name, and class name. They can delete class that they assigned. Tutor also can see their fee details in salary detail page which contains id, tutor name, student name, class name, subject name, fee and status.

4.20 Register Subject Page



Subject Register Id: ID

Tutor Name: Shikin Diyana

Subject Name: Bahasa Melayu

Class Name: Arif

ID	Subject Name	Class	Tutor Name
1	Bahasa Melayu	Arif	Shikin Diyana
2	Mathematic	Berlian	Shikin Diyana
3	English	Nilam	Shikin Diyana
5	Bahasa Melayu	Arif	Shikin Diyana

Figure 24: Register Subject Page (Tutor)

Tutor can register class using add button at the bottom but need to put id, choose tutor, subject and class as in Figure 24. Tutor can update specify class using id. Tutor can delete class using delete button.

5. Conclusion

To provide a comfortable management environment, a web-based software solution called Adami Tuition Management System will be launched. This project provides a comprehensive solution to the manual Adami Tuition Management challenges. The system is a research contribution aimed at assisting teachers at tuition centers, particularly in improving their methods of assigning exercises and homework to pupils without knowing their outcomes. Furthermore, this project has the potential to be improved and enhanced in the future. Security system for this system the password used AES Security. AES is used to encrypt sensitive data in software and hardware for this system. The Adami Tuition Management System is expected to improve the quality of previous management significantly.

Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support.

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