SECJ/SECV3104: Application Development

SYSTEM DOCUMENTATION

Project Name & Acronym: **Votion (Volunteer Tutoring)**

SDG 4 - QUALITY EDUCATION

Software House: **ZBL Spider**

School of Computing, Faculty of Engineering

Universiti Teknologi Malaysia

Stakeholders:

1. Tan Xue Ying (Product Owner)
2. Ng Rui Kang (User)

Note: This template is refined by Sulaiman (2021) based on Michaud (2011) for educational purpose only

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1 Introduction

1.1 Document Overview

This document contains the organization, the specifications, the architecture, and verification or testing of the Votion software development project.

1.2 Scope

1.2.1 Identification

This document applies to the **web application** developed in the **VOTION** project.

1.2.2 Overview

This tutor volunteer application is useful to develop an effective and friendly study application with the tutor and student who need help. This application is **needed** for creating a volunteer platform for the student to ask for help in study. For example, the students can post their question on the platform to ask for help from the tutors without any fee charges.The proposed **approach** to this software application is to allow students to ask the solution for their study and allow the volunteers who may be graduates or teachers to have a platform for them to help the people in need. Besides, it also allows the student to schedule the teaching and learning with the volunteer in order to catch up their study progress. By approaching this volunteer tutor software application, the **benefits** of this application is to solve the study problem for the student as it is a non-profit application development. Without any hesitation, it is an effective solution for the student who does not have enough money to participate in tuition. The **competitors** such as the current existing systems available are MC+ and Khan Academy. The difference between our tutor application and those two existing tutor applications is that our application is free of charge for the students and has provided a welfare for our tutor and student which is the reward points for them to claim something. The **objectives** of our volunteer tutor application development are :

(i) To analyze requirements from secondary school student during online learning

(ii) To design the proposed VOTION application

(iii) To implement and test VOTION application

1.3 Abbreviations and Glossary

1.3.1 Abbreviations

Abb	Explanation
CentOS	Community Enterprise Operating System
CSS	Cascading Style Sheets
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IDE	Integrated Development Environment
IP address	Internet protocol address
LAMP	Linux, Apache, MySQL, PHP.
PHP	Hypertext Preprocessor
SQL	Structured Query Language
UAT	User Acceptance Testing
VS Code	Visual Studio Code
XAMPP	Cross-platform, Apache server, MySql, PHP and Perl
YUM	Yellowdog Updater Modified

1.3.2 Glossary

Glossary	Meaning
Stakeholder	The people or groups affected by a software development project.
Scrum Meeting	The daily, standup meetings that occur during each of the sprint
Backlog	A prioritized and a structureslist of deliverables tasks required to support a larger strategic plan
Sprint	A set period of time during which specific work has to be completed and made ready for review

1.4 References

1.4.1 Project references

#	Document Identifier	Document Title
[R1]	Bootstrap	A sources for a reference of our application development interface

1.4.2 Standard and regulatory references

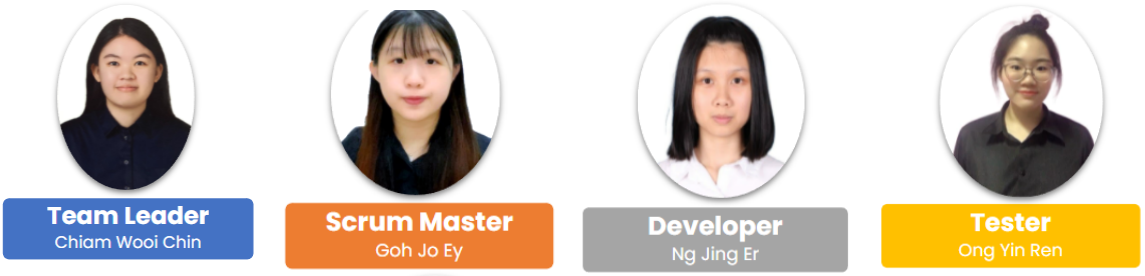
#	Document Identifier	Document Title
[STD1]	ISO/IEC/IEEE 26515:2018	Developing information for users in an agile environment

1.4.3 Other references

#	URL	Title
[OTH1]	https://mcplus.my/	MC+, an online tuition service with all the subject in Malaysia
[OTH2]	https://www.khanacademy.org/	Khan Academy offers practice exercises, instructional videos, and a personalized learning dashboard that empower learners to study at their own pace in and outside of the classroom.

2 Project Management

2.1 Team/Human Resources



2.2 Responsibilities

The team of the project has the following responsibilities:

- **Team Leader:** Chiam Wooi Chin

  [User Story US001: register profile by tutor, User Story US002: edit profile by tutor, User Story US003: delete profile by student]

- **Scrum Master:** Goh Jo Ey

  [User Story US004: add tuition appointment by student and tutor, User Story US005:edit tuition schedule by student and tutor, User Story US006: delete tuition schedule by student and tutor]

- **Developer :** Ng Jing Er

  [User Story US007: upload homework questions by student, User Story US008:edit homework questions by student, User Story US009: answer the questions by tutor, User Story US010: edit the answer uploaded by tutor, User Story US011:view the questions by history for a specific question uploaded by student, User Story US012:view the answer by history for a specific question uploaded by tutor]

- **Tester:** Ong Yin Ren

  [User Story US013: view rewards point by tutort, User Story US014:view details of rewards point by student, User Story US015: tutor able to view the reward option, User Story US016: students can view the claimable reward]

2.3 Customer-User Involvement

During the software development, the product owner (Tan Xue Ying) is involved in some of the scrum meetings and sprint demo meetings to discuss the objective that each sprint should achieve and the improvement required. While the end user (Ng Rui Kang) is involved in the user acceptance testing of the product.

The product owner is also involved in the discussion of backlog items and sprint planning. The product owner is also involved in inspecting and evaluating product progress in each iteration. The product owner had provided some feedback and opinions based on the deliverables presented in the meeting. The product owner is able to communicate with the development team to make sure the goals for each sprint are clear and the vision is aligned with product objectives.

After a sprint, the development team demonstrated the completed results to the stakeholders during the sprint demo meeting. The stakeholders are involved in the sprint demo meetings to hear the discussions about the results of work. After the sprint demo, the development team had received valuable feedback and insights from the product owner regarding the deliverables such as the improvement needed for the interfaces designed and the features of the deliverables. The development team then made adjustments and improvements regarding the product owner’s feedback.The design of the product is modified to meet the needs and requirements of the product owner. Finally, the UAT is carried out by the end user for thorough testing on the product.

2.4 Tasks, Planning, and Milestones

The below backlog is the list of tasks created which should be completed in order to achieve the product goal. The entire estimated time for our product backlog is **56 days**. Our proposed application contains 4 subsystems which are user, tuition, homework and rewards. Each team member is in charge of a specific subsystem. The story points and priorities for each job have been modified according suitability before the sprint started to ensure the goals for each sprint are able to be achieved. The table below shows the product backlog for the Votion application:

Table 2.4.1: Product backlog for Votion

Task ID	User Story ID	Estimate (Day)	Priority	Team Member
ZBLS-1	US001	10	1	Chiam Wooi Chin
ZBLS-4	US004	6	2	Goh Jo Ey
ZBLS-7	US007	7	3	Ng Jing Er
ZBLS-13	US013	3	4	Ong Yin Ren
ZBLS-2	US002	10	5	Chiam Wooi Chin
ZBLS-5	US005	10	6	Goh Jo Ey
ZBLS-9	US009	12	7	Ng Jing Er
ZBLS-14	US014	10	8	Ong Yin Ren
ZBLS-6	US006	6	9	Goh Jo Ey
ZBLS-11	US011	7	10	Ng Jing Er
ZBLS-12	US012	7	11	Ng Jing Er
ZBLS-15	US015	10	12	Ong Yin Ren
ZBLS-3	US003	5	13	Chiam Wooi Chin
ZBLS-8	US008	7	14	Ng Jing Er
ZBLS-10	US010	7	15	Ng Jing Er
ZBLS-16	US016	10	16	Ong Yin Ren

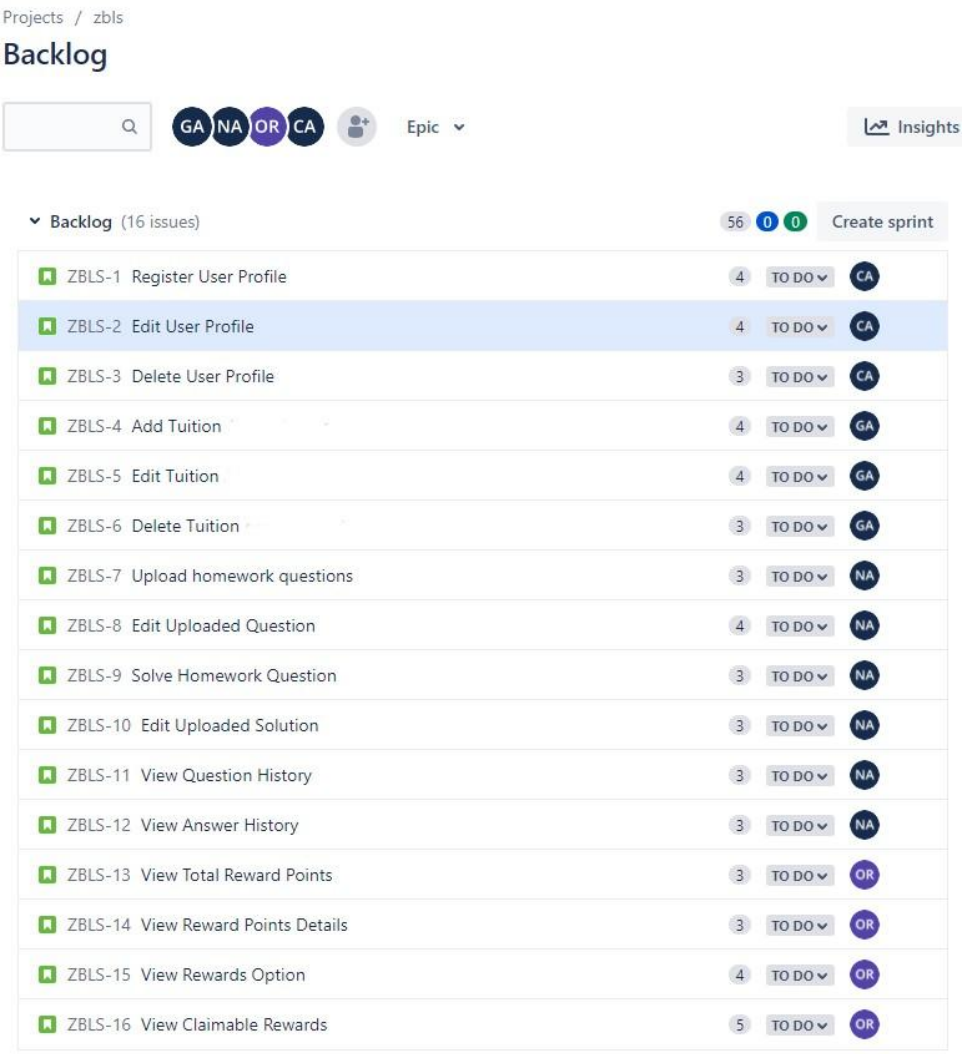
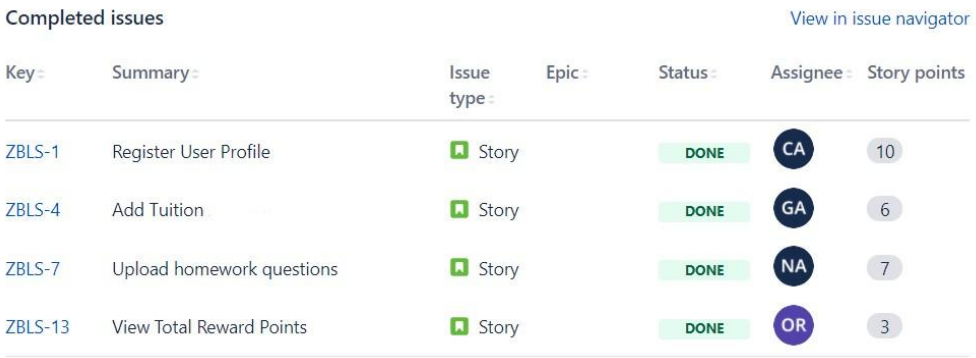


Figure 2.4.1: Backlog for Votion

The project is divided into **4 sprints,** where each sprint lasts 2 weeks. The tasks must be completed and ready for evaluation within the sprint. Sprint #1 is started on 7th November 2021 until 20th November 2021 and continued with Sprint #2 which started on 21st November 2021 until 4th December. Next, Sprint #3 is between 12th November 2021 to 25th December 2021. And the last sprint, Sprint #4 is between 26th December 2021 and 10th January 2022. All team members are involved in every sprint which enables the tasks listed to be achieved. According to the results of sprint planning meetings, the tasks are distributed into different sprints according to their priority. The story points estimated for all tasks are initially set as 3 to 4 days. The story points are then modified according to suitable estimation within the sprint.

There are two types of users involved in this project, which are tutor and student. The project is started with **Sprint #1**. There are 4 tasks included in Sprint #1: "Register User Profile" with 10 estimate days, "Add Tuition" with 6 estimate days, "Upload Homework Questions" with 7 estimate days and "View Total Reward Points" with X estimate days. Each of the members is assigned one task. The figure below shows tasks included in Sprint #1 generated in JIRA:

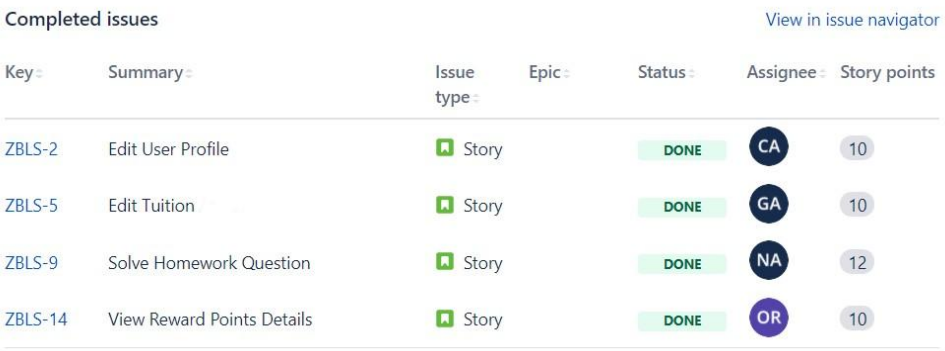


Completed issues — View in issue navigator

Key	Summary	Issue type	Epic	Status	Assignee	Story points
ZBLS-1	Register User Profile	Story		DONE	CA	10
ZBLS-4	Add Tuition	Story		DONE	GA	6
ZBLS-7	Upload homework questions	Story		DONE	NA	7
ZBLS-13	View Total Reward Points	Story		DONE	OR	3

Figure 2.4.2: Sprint 1 for Votion

For **Sprint #2**, the tasks are arranged in the continuation of work to improve the basic function created in Sprint #1. In Sprint #2, the tasks "Edit User Profile " and "Edit Tuition" are added into this sprint. Both the story points estimated for these tasks are 10 days. The next task is "Solve Homework Question", with 12 estimated days. Finally is "View Reward Points Details" with 10 estimated days. The figure below shows tasks included in Sprint #2 generated in JIRA:



Completed issues — View in issue navigator

Key	Summary	Issue type	Epic	Status	Assignee	Story points
ZBLS-2	Edit User Profile	Story		DONE	CA	10
ZBLS-5	Edit Tuition	Story		DONE	GA	10
ZBLS-9	Solve Homework Question	Story		DONE	NA	12
ZBLS-14	View Reward Points Details	Story		DONE	OR	10

Figure 2.4.3: Sprint 2 for Votion

There are four tasks included in **Sprint #3**, which consist of "View Question HIstory" with 7 estimate days, "View Answer History" with 7 estimate days, "Delete Tuition" with 6 estimate days and "View Rewards Option" with 10 estimate days. The leader is responsible to monitor the progress of Sprint 3 to make sure the tasks can be completed on time and keep the product owner informed about the progress. While other members focus on tasks assigned. The figure below shows tasks included in Sprint #3 generated in JIRA:

Figure 2.4.4: Sprint 3 for Votion

Next is the **Sprint #4**. In this sprint, the tasks with the least priority function are included. The tasks involved in this sprint are "Edit Uploaded Question" with 7 estimate days, "Edit Uploaded Solution" with 7 estimate days, "Delete User Profile" with 5 estimate days and "View Claimable Rewards" with 10 estimate days. Sprint #4 is the last sprint of the project. Thus, all the tasks should be completed in this sprint and achieve the product goal. The figure below shows tasks included in Sprint #4 generated in JIRA:

Figure 2.4.5: Sprint 4 for Votion

2.5 Development Environment

The development environment is initially hosted locally by the development team, where the source code is downloaded in the local machine. This is to allow the team member to make changes and modifications to the development environment and make sure everything works fine before deploying the changes to a live environment.

The IDE is often used as a programming tool to assist the team in the development process. The IDE used in this project is **VS Code.** The IDE enables the team to write, edit and update source code. It is also used as a debugger as well as the compiler to process the programming tasks.

For the interface design, we had chosen the pre-designed template of Mentor v4.7.0 from **Bootstrap**. The development of **front-end and back-end** involved the use of programming languages such as **HTML, PHP, Javascript and CSS**. We also implemented CSS to define the styles of our web application design including the layout, color and pattern design.The result of the coding can be viewed and interacted by accessing the localhost server.

Navicat is connected to **XAMPP** which includes **phpMyAdmin and MySQL**. In the initial phase, these software tools are used for database management and development. At the deployment phase, the framework used is Linux, where APACHE is the web server used. The database will be stored in the **Huawei Cloud, phpMyAdmin, MySQL and MariaDB** will be used for the database management and development.

2.6 Other Resources

There is no particular resource needed for the project. Hence, no specific resources are needed for the project.

2.7 Software Life Cycle Model

The software life cycle model used in this project is an **Agile model**. Agile model is the combination of iterative and incremental process models.The agile model is used to break the product into cycles or sprints. Every sprint involves cross functional teams working simultaneously on various areas like: Planning, Requirements Analysis, Design, Coding, Unit Testing and Acceptance Testing. Before starting a project, a meeting with the product owner is required to **gather the requirements and plan** the work required to build the project.

Once the requirements are defined, the work begins where the development team starts working on the project **design and coding** and deploying a working product. For each sprint, the development team is required to deliver specific features for that sprint. As in our project, the product is distributed into 4 sprints which consist of 4 tasks respectively. Each sprint is within 2 weeks. By breaking the product into sprints, the development team is able to deliver a working product to the product owner in each sprint.

The agile model emphasizes the interaction among the developers, product owners to work together throughout the project. During the process of each sprint, the product is **reviewed** and continuously discussed together with the product owner. The development team should understand the product requirements and respond to the feedback and needs stated by the product owner during the development in each sprint. At the end of the sprint, the product should hold all the features required by the customer. And the deliverables should undergo a **user testing** phase with the end user to examine the product's performance and check for the bugs. At the end of the project, a working product is displayed to the product owner.

2.8 Reviews

In **Agile** application development, the sprint is set to have two weeks, and all future sprints are the same. The tasks assigned have to be completed by the development team and made ready for review. The project is started with a **launch review**. The development team acquainted the project goals and all the information contained in the management plan. The

development team is required to present the proposal to the product owner to ensure the team is clear about the product goals and task distribution according to the project planning in each sprint. Once the project is approved by the product owner, the development team is required to continue with the work.

During the sprint, our team managed to hold 4 scrum daily meetings in each sprint to discuss the progress and brainstorm solutions to the problems faced. Besides, the team is required to carry out meetings with the product owner for **design review and test review** of the progress of the product in each sprint. For the tasks that are completed by the members will be tested by the product owner. The product owner provided her insights and feedback to the team based on the current design after testing. The design and development of the product is determined whether it was in accordance with requirements as requested. The team is allowed to continue the work once approved and continuous improvement should be done.

At the end of each sprint, the development team is required to present a **sprint demo** of the currently completed work to the product owner to see whether it achieves the required tasks. Each developer is taking turns to show off their work and is required to answer the questions by the product owner if any. The team demonstrates the fixed bugs or problems, the new features added to the product owner. The development team may continue to the next sprint once a sprint is completed. The final sprint is the Sprint 4. Finally, the last phase involved the end user for **acceptance testing**.

The project ends with the **final review** where the product and documentation is completed. The project manager is required to verify and validate the VOTION project. The team is required to share the experience during the progress of the project.

2.9 Software Configuration Management

Our project software configuration management tool is using Git to manage our repositories. For our initial project integration development, we are using the Visual Studio Code to write the PHP code and Navicat to create the MySQL database and both connect to

the Xampp localhost. Therefore, we save our source code PHP files and other CSS and configuration documents in one folder and SQL database files in another folder as our work, integration and delivery repositories and upload them to GitHub as the Git repositories. Then, we shared the Git repositories among our team members on GitHub. We update and organize our changes on the repositories that we created for the coding and database. There are current and previous versions of the Git files included for changes tracking among our team members. For the project deployment stage, we get the Git repository from GitHub by creating the URL for git clone on the CentOS to the Huawei Cloud server deployment and phpMyAdmin MySQL to connect the SQL database.

2.10 Documentation Management

The project documentation that involves in our project such as project proposal, slides for four sprint review meetings and the system documentation. For these documents, we identified based on our project title and the development progress of this project. We managed it by updating the changes between our team members from initial to final phase. For example, we are using Google Docs and Google Slide as our documentation collaboration between our team members to communicate the problems and resolve the issue for this project. We also managed by using the Jira tool for the document progress which is the backlog, sprint and burn down chart of this project.

Besides, the project documentation is stored in the folder of Google Drive of each member and also Windows libraries on our own computer hard drive. The documents are also archived to every member document storage to improve our workflow and performance by saving the space and time for managing them such as the project proposal and the initial project documentation. The revision of these documents is automatically managed by the document version features in Google docs which according to date and time of changes made by which author.

The approval of these project documents such as through Sprint review meetings for every sprint which attended by all team members, product owner and user. Each project management document is verified by one of the developers of our team which is the member assigned to lead UAT. All of the project documents are approved by the team leader and the project meetings report such as the project scrum daily log meeting are verified by all of the attendants of the meetings which are the team members, product owner and the user representative.

2.11 Verification

For our project verification, we check our product which is a web application to achieve the goals of the product without any bugs by the process of review, documentation, then testing in every Sprint and finally the UAT.

First, we manage the verification by review. The review includes launch review, design and test review, sprint demo and the final review which is to review our product to the product owner and then check if the requirement and specification of the product meet the requirement of the product owner so that we can continue our software development. Then, the documentation is used to save and update our changes of project management and configuration management in a systematic way to check that the product is developed in a successful way to reduce the count of defects in the later stages of development.

Besides documentation, we also test the product in every Sprint to make sure that the product is developing according to the requirement and specification as defined on the first stage and meet every updated requirement of the product owner and user. Finally, the UAT is carried out to identify any possible bug or issue before release to the product owner and real user. Then, the UAT is given to the product owner and end user to verify the software which meets their requirement and is able to carry out required specific tasks that are designed for the real-world situation.

3 Specifications

3.1 System Features

Volunteer Tuition Application system provides a platform for students to search for help in their study issue and for tutors to help the students in study. There are several system features based on the use case diagram below. The tutor and student are able to manage user profiles and manage tuition schedules by add, edit and delete. The student is able to upload the question of homework while the tutor is able to solve the question of the student's homework then the tutor and student is able to view the question and answer. Besides, the tutor and student are able to view the reward points and claim the rewards using the points.

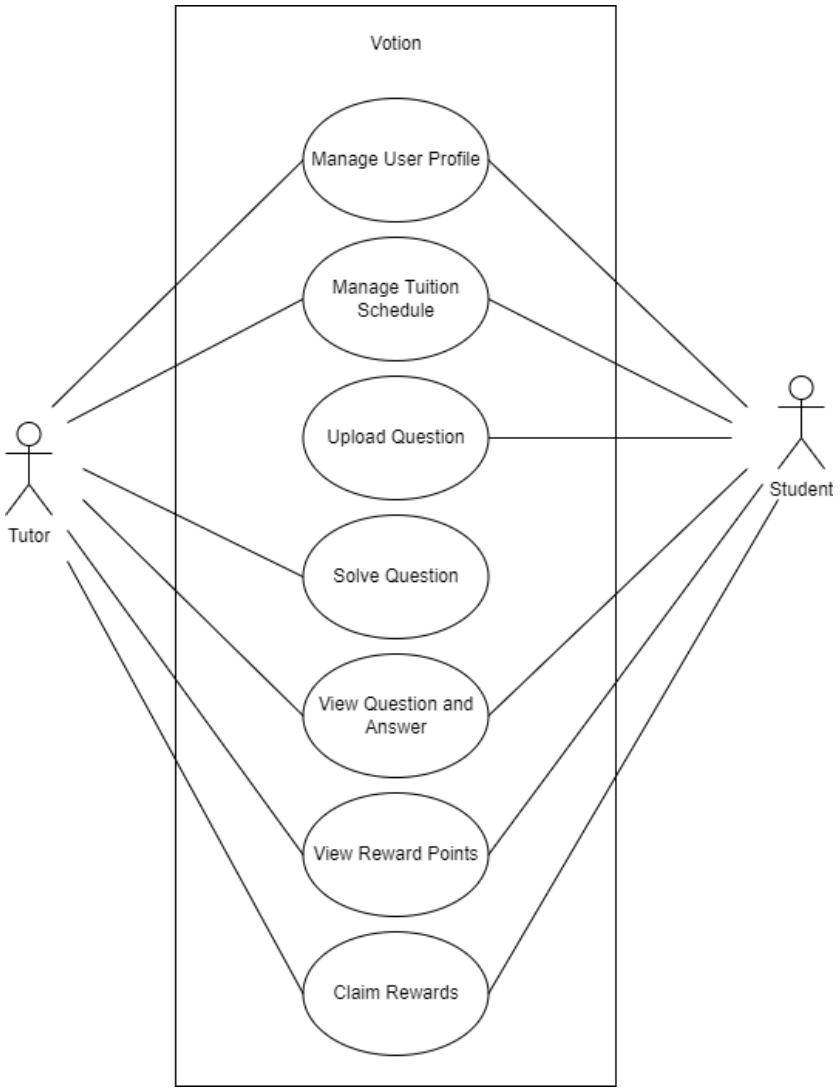


Figure 3.1: Use Case Diagram for Votion

3.1.1 Use case UC001 < Manage User Profile >

Tutor and Student can manage their user profile by registering their profile with adding the user profile details. They also can edit and delete their user profile. There are 3 user stories under this use case.

3.1.1.1 User Story US001

As a Tutor, I want to register the profile by adding the user profile details so that I can be a volunteer tutor in this online tuition system.

3.1.1.2 User Story US002

As a Tutor, I want to edit the user profile details so that the user profile details are latest updated.

3.1.1.3 User Story US003

As a Student, I want to delete the user profile so that I will no longer have the user profile in this online tuition system.

3.1.2 Use Case UC002 <Manage Tuition>

In this use case, the students and tutor can manage tuition schedules in the application based on their need. They can arrange a tuition class, edit the tuition schedule, and delete the tuition class in this use case. There are three user stories under this use case and will be explained in detail in the next section.

3.1.2.1 User Story US004

As a Student, I want to add a tuition schedule so that I can arrange tuition for the topic that I'm unclear about.

As a Tutor, I want to add a tuition class so that I can arrange volunteer tuition for the students.

3.1.2.2 User Story US005

As a Tutor, I want to edit my tuition schedule in the application so that I can adjust my tuition time as needed.

As a Student I want to edit my tuition schedule in the application so that I can cancel my schedule as needed.

3.1.2.3 User Story US006

As a Student/Tutor, I want to delete my tuition schedule so that I can cancel the tuition class if I have an emergency and cannot attend the class.

3.1.3 Use Case UC003 <Upload Question>

Students shall be able to upload questions of homework exercises to ask the tutor. There are 2 user stories under this case.

3.1.3.1 User Story US007

As a student, I want to upload homework questions so that I can get help from an expert tutor to solve my academic problems.

3.1.3.2 User Story US008

As a student, I want to edit the questions uploaded so that I can make changes on questions uploaded as needed.

3.1.4 Use Case UC004 <Solve Question>

Tutor shall be able to solve questions uploaded by the students. There are 2 user stories under this case.

3.1.4.1 User Story US009

As a tutor, I want to answer the questions uploaded by students so that I can help them to solve their academic problems.

3.1.4.2 User Story US010

As a tutor, I want to edit the answer uploaded so that I can make changes on the answer uploaded as needed.

3.1.5 Use Case UC005 <View Question and Answer>

The tutor and student shall be able to view the particular question and answer uploaded on the system. There are 2 user stories under this case.

3.1.5.1 User Story US011
As a student, I want to view the question history for a specific question uploaded so that I can review the best answer for my question.

3.1.5.2 User Story US012
As a tutor, I want to view the answer history for a specific question uploaded so that I can review others' answers.

3.1.6 Use Case UC006 <View Rewards Points>

Tutors and students shall be able to view their reward points after uploading the question and answer the question in this application. There are 2 user stories under this case.

3.1.6.1 User Story US013
As a user, I want to view my total rewards points so that I can review my total rewards points.

3.1.6.2 User Story US014
As a user, I want to view the details of the point history so that I can know how I earn the rewards point.

3.1.7 Use Case UC007 <Claim Rewards>

Tutors and students shall be able to claim their reward points in the application. There are 2 user stories under this case.

3.1.7.1 User Story US015
As a user, I want to view the reward option available on this website so that I can get the information of the reward.

3.1.7.2 User Story US016
As a user, I want to view claimable reward with my reward points so that I can claimed my rewards in an easy way

3.2 Performance

The website's load time should not be more than one second for users. For the response time, the system should display the pages within milliseconds while if there is any delay for the pages, the delay should be less than 8 seconds. For the requirements, the application should be able to process 10000 requests per second in the peak load and it should be able to accept every request submitted. The application should update the interface on interaction within 2 seconds. The database should be normalized to prevent redundant data and improve performance. The database should be distributed to prevent outages.

3.3 Other Features

1. **Security**
   The application should protect the user password against unauthorized access.
   The application should not allow users to update and delete other user's information.
   The databases should be behind a firewall.

2. **Mobility**
   The user should be able to access the application with both PC and mobile.

3. **Availability**
   The tutor and student shall be able to view the application anytime.

4. **Usability**
   The system shall be able to display a good appearance of the user interfaces that are user friendly to the tutor and students.

5. **Accuracy**
   The system shall be able to display accurate information of user class and homework information and reward points.

6. **Safety**
   Databases should use sharding to be redundant to prevent loss of data.
   Backups of the databases should be done hourly and be kept for one week.

3.4 User Interface Layout

Log in (tutor/student)

Users can log in to the website by filling in their userID and password.

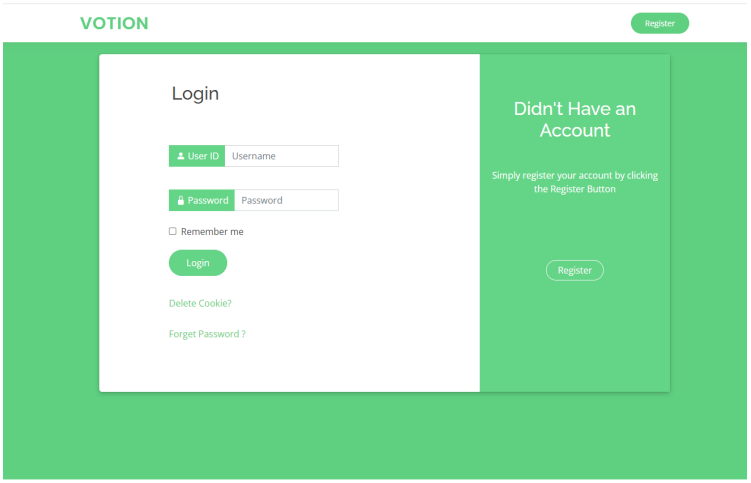


Figure 3.4.1.1 Login interface

User Profile (tutor/student)

Users can register their user profile by filling in their details such as user ID, password, user type which are tutor or student, address details, email address telephone and upload their profile picture. Then, users can view their user profile details on the Profile page and edit their user profile by updating the user profile details or changing password. The users also can delete their user profile by confirming their password.

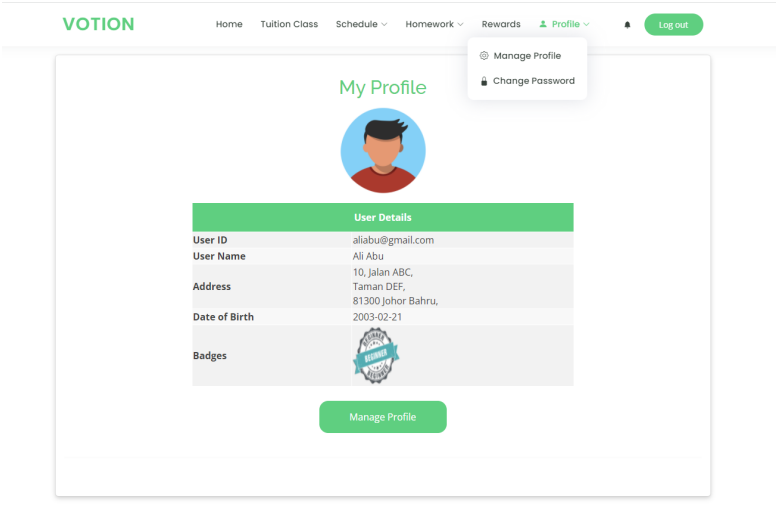


Figure 3.4.2.1 User Profile interface

Home Page (tutor/student)

This is the homepage of VOTION after users login to the website.

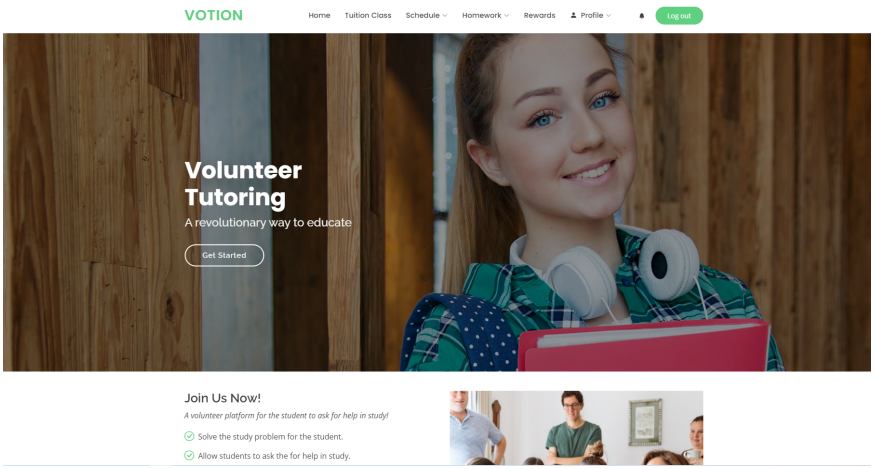


Figure 3.4.3.1 Homepage interface

Tuition Class (tutor/student)

Tutors can add the tuition class programmes for the students to join tuition class details such as class name, description, date, time, available seat, tuition subject and form level.

Students can enroll the class by choosing any tuition programmes that they want to book and then book the class with the username. Each tuition class has the class details such as tuition subject, tutor name, form level, class name, description, date, time and available seat.

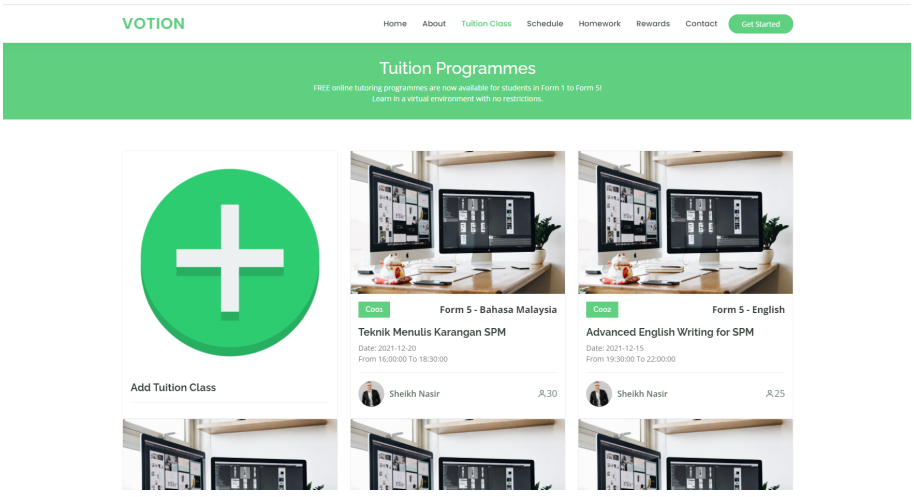


Figure 3.4.4.1 Tution class programmes (tutor) interface

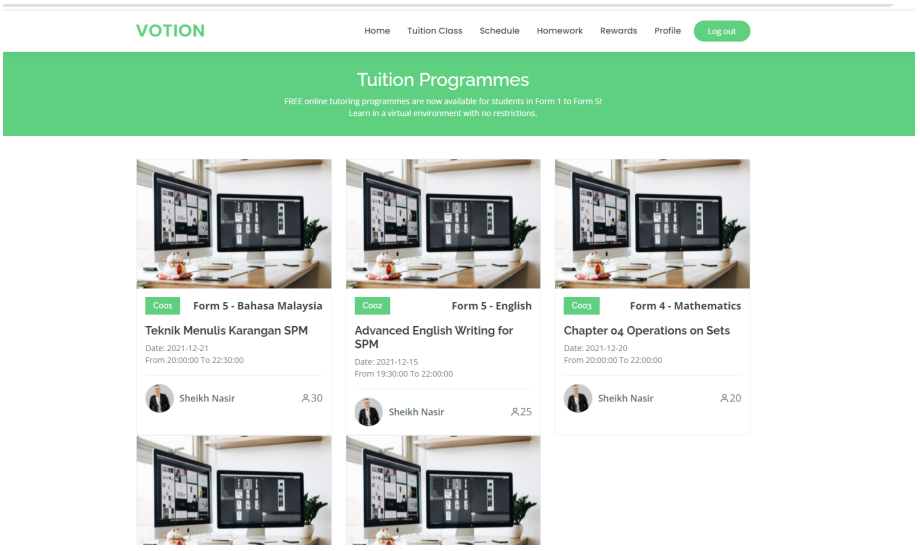


Figure 3.4.4.2 Tution class programmes (student) interface

Schedule (tutor/student)

Tutors can view scheduled class with the tuition class details such as class ID, class name, description, date and time and edit their schedule class with the tuition class details which are tuition subject, form level, class name, description, date, time and available seat.

Students can choose to schedule a class or view and edit their schedule on the Schedule page. For scheduling a class, students can make a tuition class by searching the subject and date for the available class to enroll. For view and edit their schedule, the students can view their class schedule and edit their schedule by canceling the enrolled class.

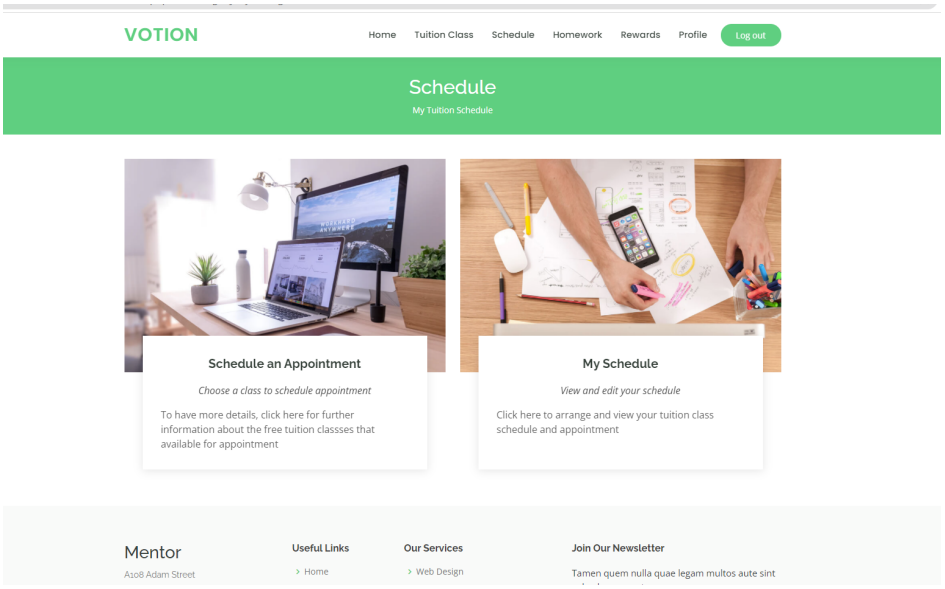
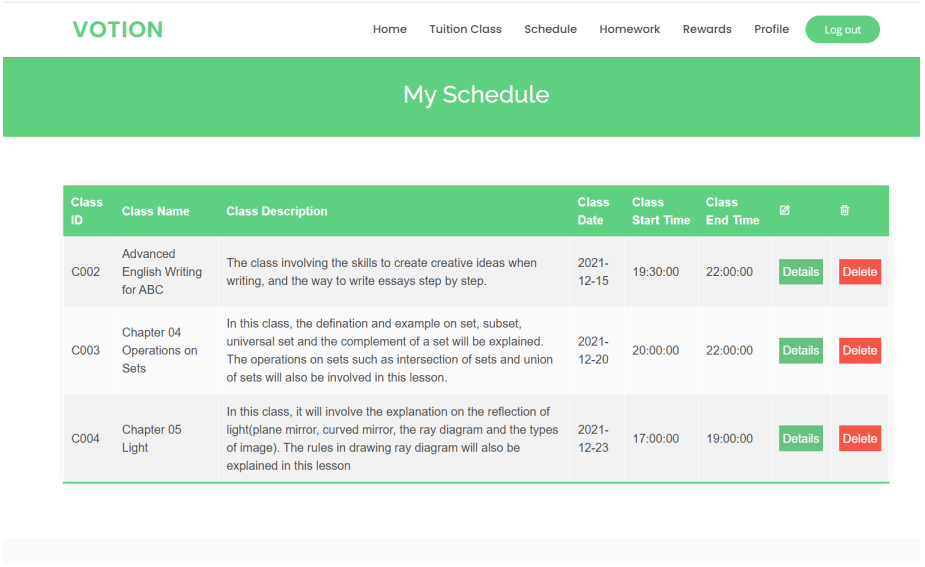


Figure 3.4.5.1 Schedule page interface



Class ID	Class Name	Class Description	Class Date	Class Start Time	Class End Time		
C002	Advanced English Writing for ABC	The class involving the skills to create creative ideas when writing, and the way to write essays step by step.	2021-12-15	19:30:00	22:00:00	Details	Delete
C003	Chapter 04 Operations on Sets	In this class, the defination and example on set, subset, universal set and the complement of a set will be explained. The operations on sets such as intersection of sets and union of sets will also be involved in this lesson.	2021-12-20	20:00:00	22:00:00	Details	Delete
C004	Chapter 05 Light	In this class, it will involve the explanation on the reflection of light(plane mirror, curved mirror, the ray diagram and the types of image). The rules in drawing ray diagram will also be explained in this lesson	2021-12-23	17:00:00	19:00:00	Details	Delete

Figure 3.4.5.2 Scheduled class (tutor) interface

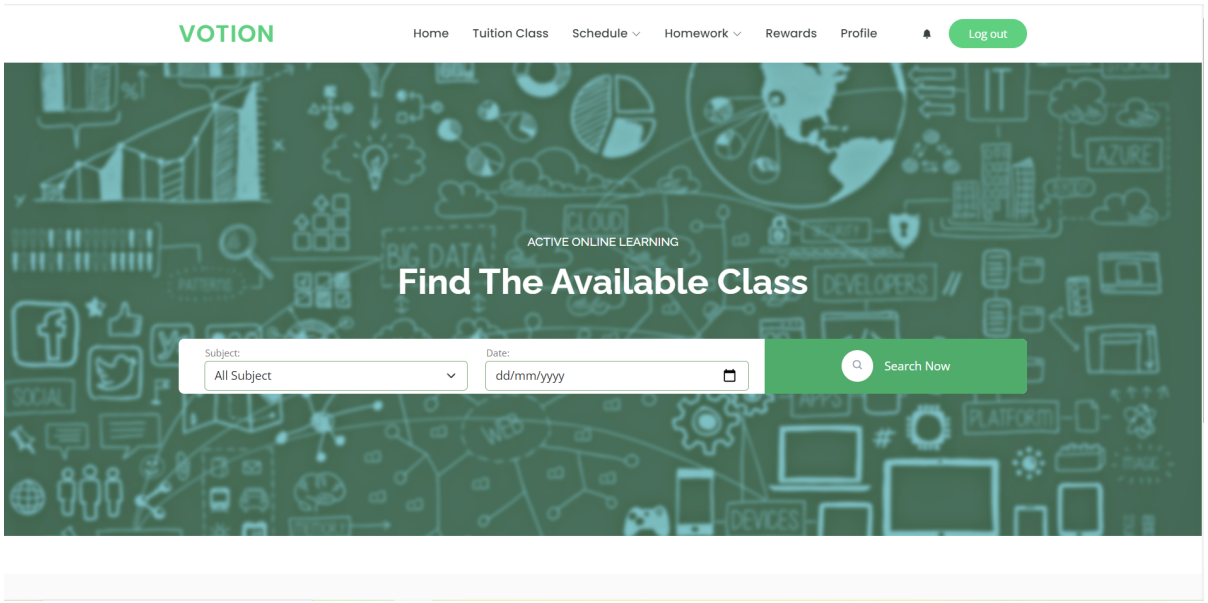


Figure 3.4.5.3 Search the available class (student) interface

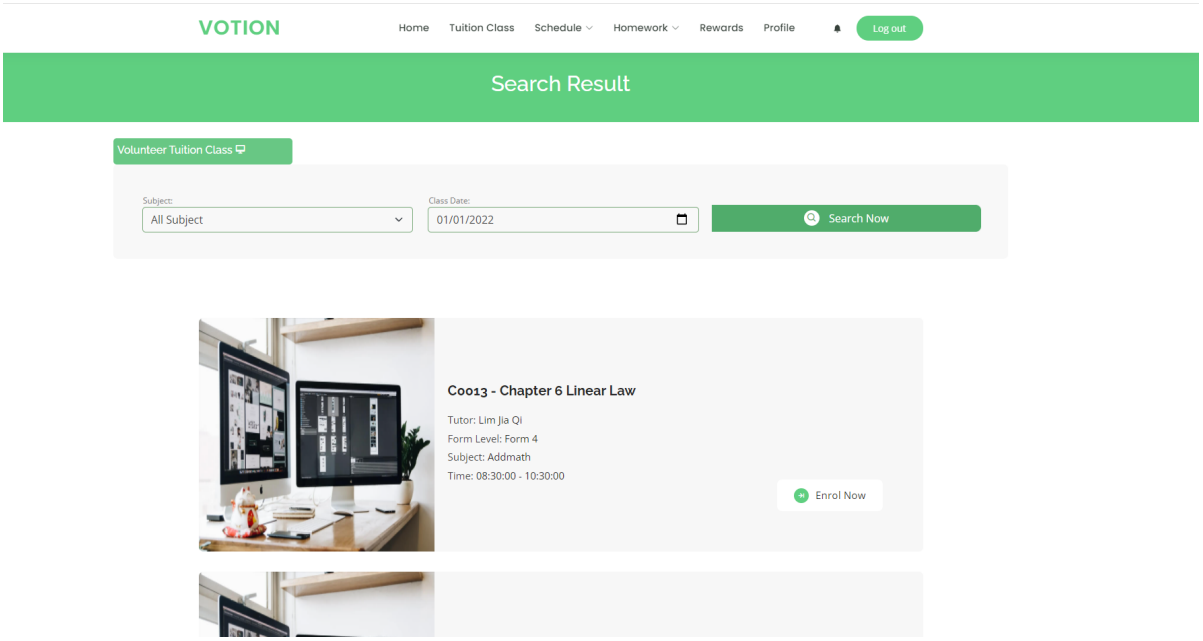


Figure 3.4.5.4 Search result based on the search criteria (student) interface

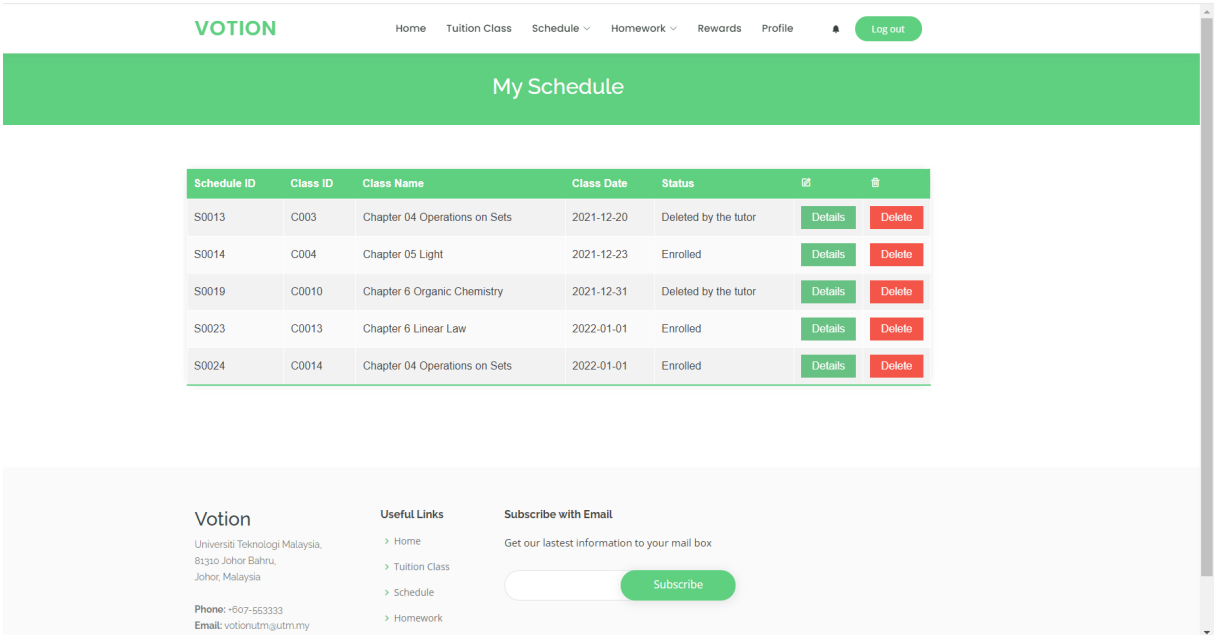


Figure 3.4.5.5 Class Schedule (student) interface

Homework (tutor/student)

Students can upload the question on the Homework page by uploading the question details such as question title, content and image file of question. Students can also view the question and answer after the question is solved and edit the questions updated.

Tutors can view the question and then solve it by uploading the answer on the Homework page with the answer details such as answer content and image file of answer and also edit the answer updated.

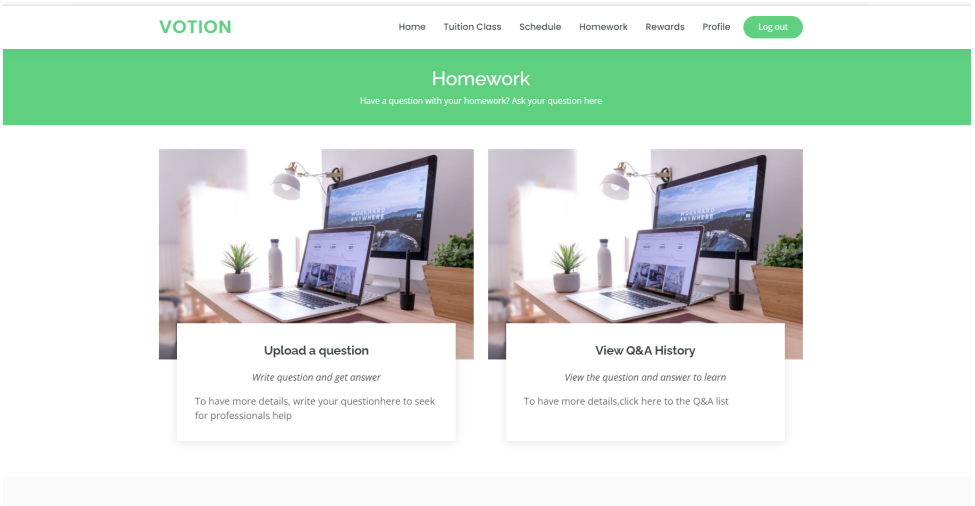


Figure 3.4.6.1 Homework page interface

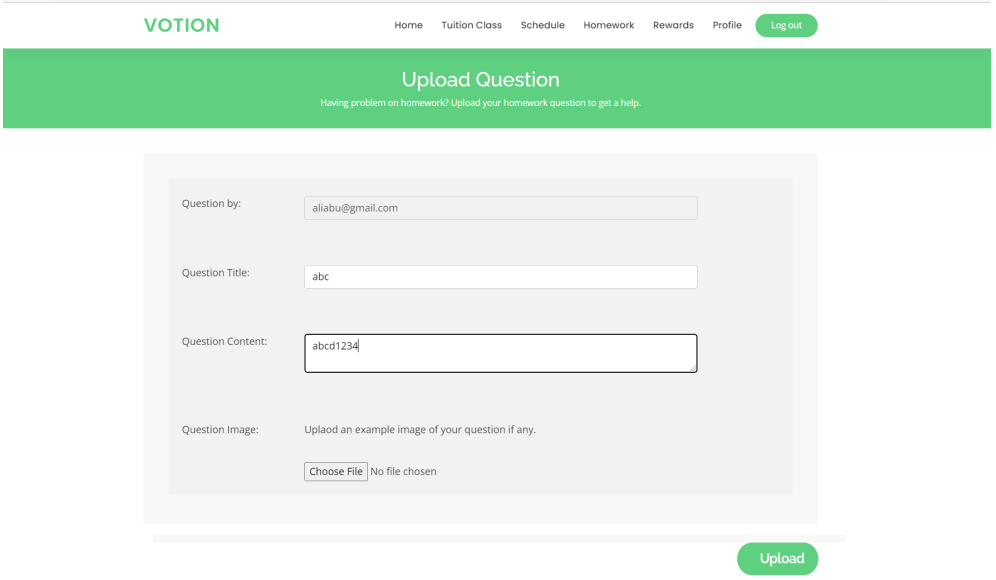


Figure 3.4.6.2 Upload question (student) interface

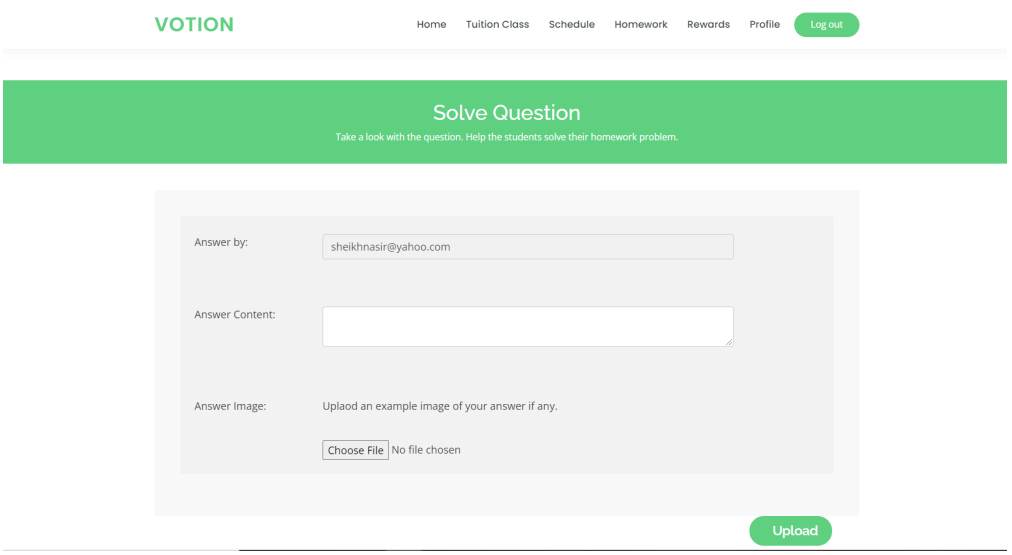


Figure 3.4.6.3 Solve Question (tutor) interface

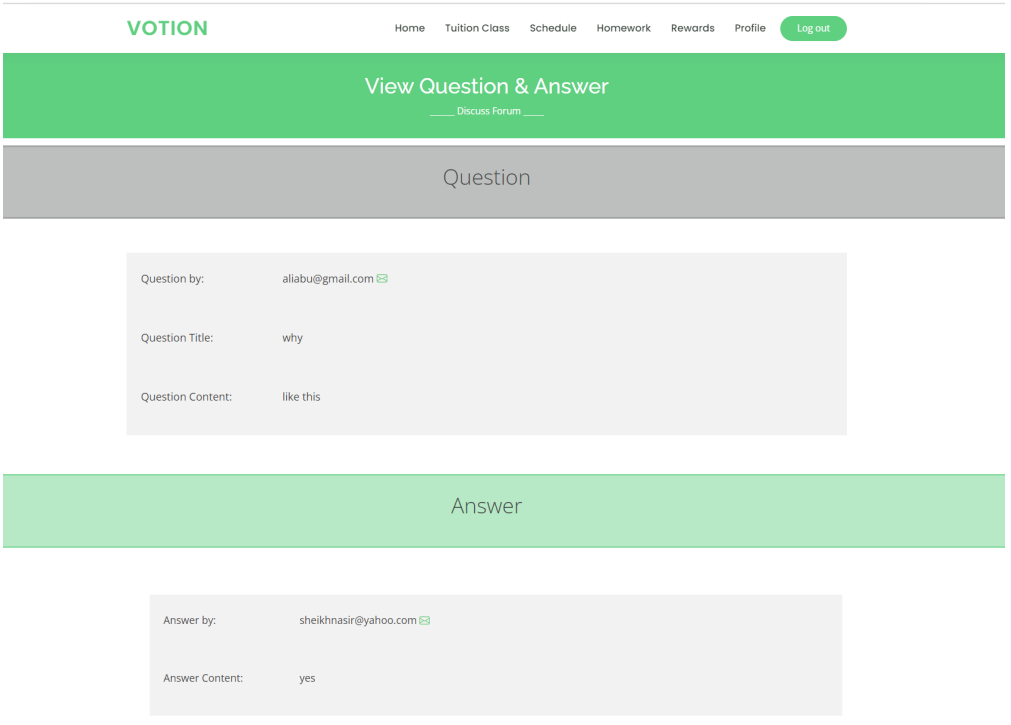
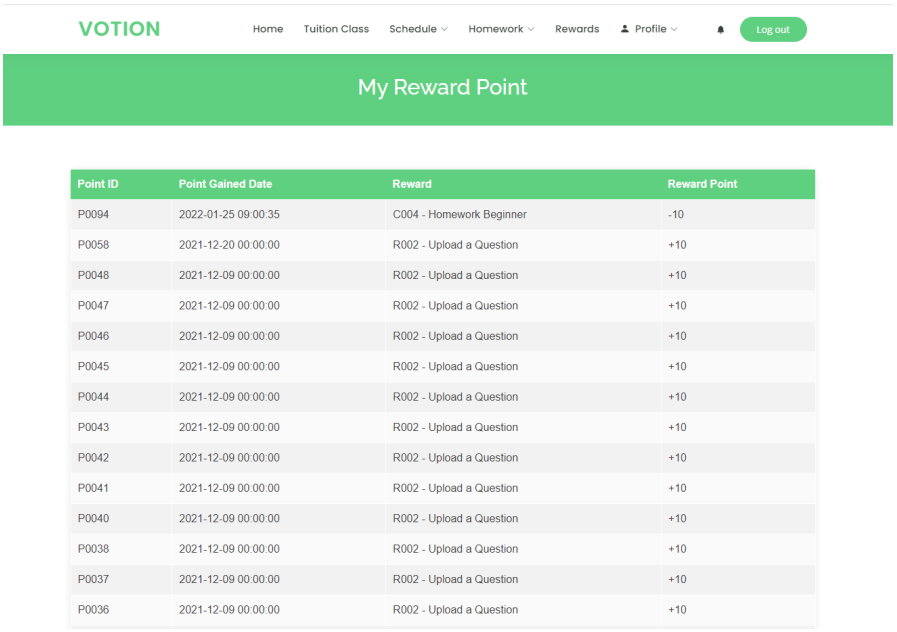


Figure 3.4.6.4 Question and Answer interface

Reward points (tutor/students)

Tutors and Students can view the reward points and point history after uploading questions and solving the questions. Then, they also can claim their badges with the reward points collected.



Point ID	Point Gained Date	Reward	Reward Point
P0094	2022-01-25 09:00:35	C004 - Homework Beginner	-10
P0058	2021-12-20 00:00:00	R002 - Upload a Question	+10
P0048	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0047	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0046	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0045	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0044	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0043	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0042	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0041	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0040	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0038	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0037	2021-12-09 00:00:00	R002 - Upload a Question	+10
P0036	2021-12-09 00:00:00	R002 - Upload a Question	+10

Figure 3.4.7.1 Reward points history interface

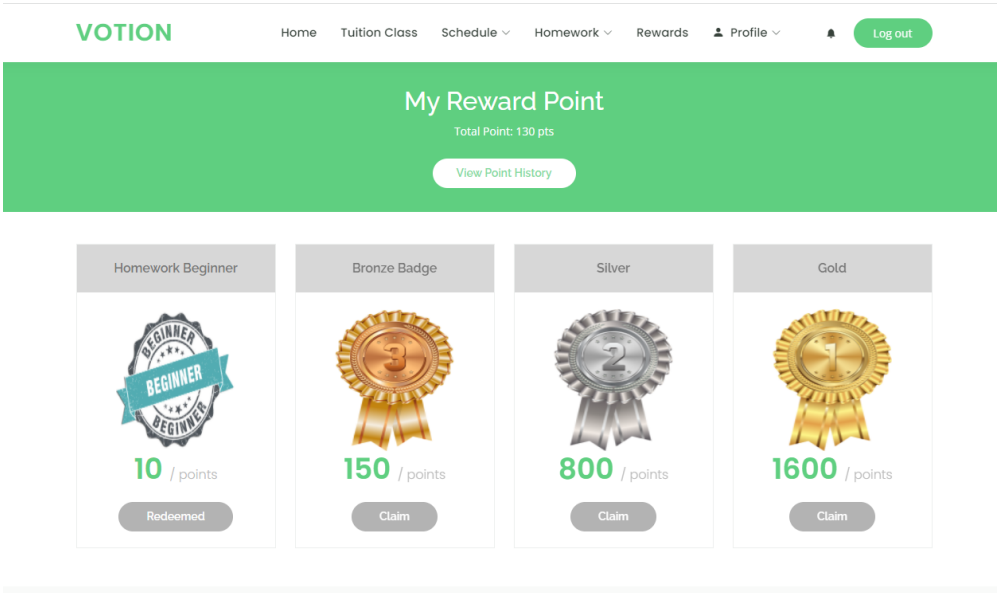


Figure 3.4.7.2 Reward- Claim Badges interface

3.5 System Environment

Our project proposed application does not integrate in a specific system. The system environment of our proposed application includes the Windows and Linux operating system.

3.6 External Interfaces

The external interfaces of the web application included the resource and the requirements for the hardware interfaces, network interfaces, and the system data exchanges. The hardware interfaces are the integrations of the hardware and software while the network interfaces are the communications and the networks for the web application.

3.6.1 Hardware interfaces

The developed web application is allowed to work in several computing platforms which are known as multi-platform software. The web application developed supports different hardware devices. It can be run in the browser with different types of hardware devices. It is allowed to work on Windows, Linux, and Mac. At the earlier stage of the web application, the system shall be hosted locally. The device types supported by this web application included laptops, personal computers and mobiles. The web application is accessible by the laptops and personal computers with different operating systems while the mobile phone is also accessible to the web application with the installed web browser in the devices.

At the earlier stage of the web application, the user can access the application with localhost and access the database of the system in Navicat by using XAMPP. XAMPP is cross-platform software that includes the Apache web server and MySQL database. The system will extract the data from Navicat with the selected database and run the packages of source code on the localhost. The data is only allowed to be stored in the local host.

At the deployment stage, the documentation, source code and database are stored in the cloud services Huawei Cloud. Huawei Cloud provides the cloud computing services that run on the same infrastructure owned by Huawei Company.

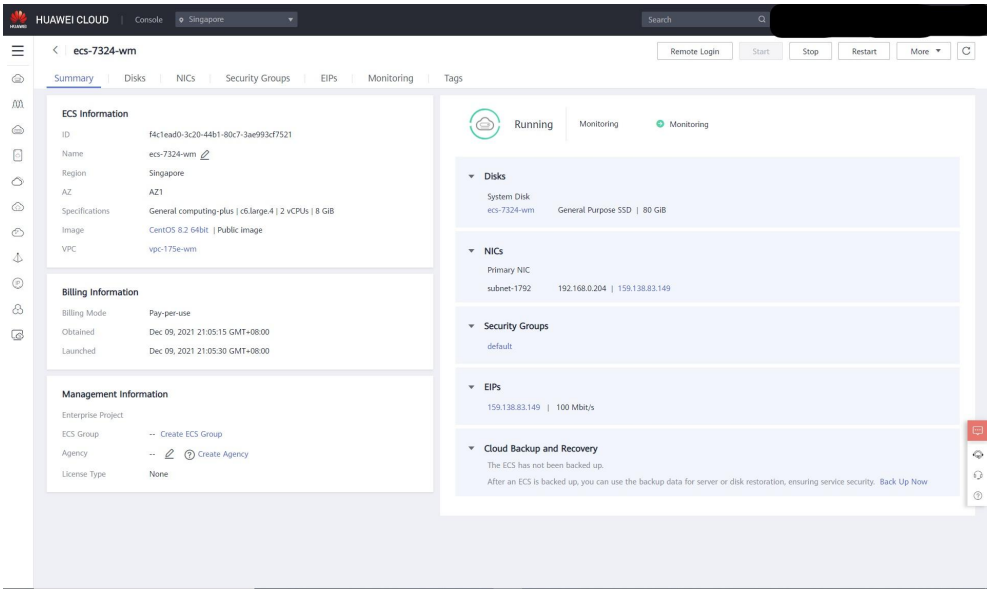


Figure 3.6.1.1: Interfaces of Huawei Cloud

Linux is used as the operating system for web deployment. The web deployment utilizes the Linux distribution, CentOS that provides the cross-platform for the web deployment. Apache HTTP web server is used as the cross platform web server software used for this web application. The documentation and the source code are managed by using GitHub to manage the project repositories and coding collaboration. The git clone command creates the copy of the project repositories to the CentOs. All the system data is stored in and extracted from the cloud server database. The phpMyadmin in CentOS is used to manage all the operations of MySQL and MariaDB. All the data can be accessed and written by the users and stored in the cloud database.

3.6.2 Network interfaces

The Huawei Cloud server has an IP address which is 159.138.83.149. The HTTPd is the software of Apache HTTP server that listens and responds to the network requests. The network request is expressed using the HTTP. The firewall settings are modified to connect to the selected port and allow the http protocol connections.

3.6.3 Data exchange

The VOTION system does not have data exchanges in interface with other softwares.

3.7 Resources

3.7.1 Hardware resources

The hardware resources stated below that allowed the devices and system processors to communicate are the processor, memory, and resolution. A few minimal requirements should be met in order for the web application to run. A minimum of 1.9 GHz x86 dual core processor is required for this web application. Besides, a minimum of 2GB RAM is required for the memory requirement and a minimum of Super VGA with a resolution of 1024x768 is required for the display. For the windows, a minimum of Windows 7 or higher is required to run the web application.

In the deployment stage, the linux is used as the operating system while CentOS is the RPM-based Linux distributor for the web application. CentOs served as the package manager for the YUM in the Linux operating system. The version for the Linux is 4.18.0-348.2.1.el8_5.x86_64 and the version for the CentOS is CentOS Linux release 8.5.2111.

3.7.2 Software resources

3.7.2.1 Operating System

This web application supports Linux, Windows, and macOS as operating systems.

3.7.2.2 IDE

Visual Studio Code is the IDE utilized in this system. The system's debugging, code refactoring, and compilation are all supported by the IDE. Visual Studio Code has a workspace that supports most programming languages, such as HTML, JavaScript, CSS, SQL, PHP, and others. The front end programming languages used for this web application are HTML, CSS and Javascript while the back end programming language is PHP.

3.7.2.3 External Program

This web application uses Bootstrap as an external library for HTML, CSS, and JS. Along with the framework, it primarily supplies the UI component and the web layout.

3.8 Internal Data

The VOTION system is divided into several subsystems which include the user, tuition, homework and reward subsystem. The user subsystem stores the personal information of the users and categorizes the user type. The tuition subsystem stores the class information which is categorized by subject and the details of the tuition schedule. The homework subsystem consists of the information of the list of questions and answers uploaded by different users. The rewards subsystem consists of the type of rewards and the point gained history of the users. The data is organized into attributes with recognizable names. To enable precise search and retrieval of the data, the file name of the document will reflect the content of the files. The tables below show the entities involved in the system.

Entity-Relation Diagram(ERD)

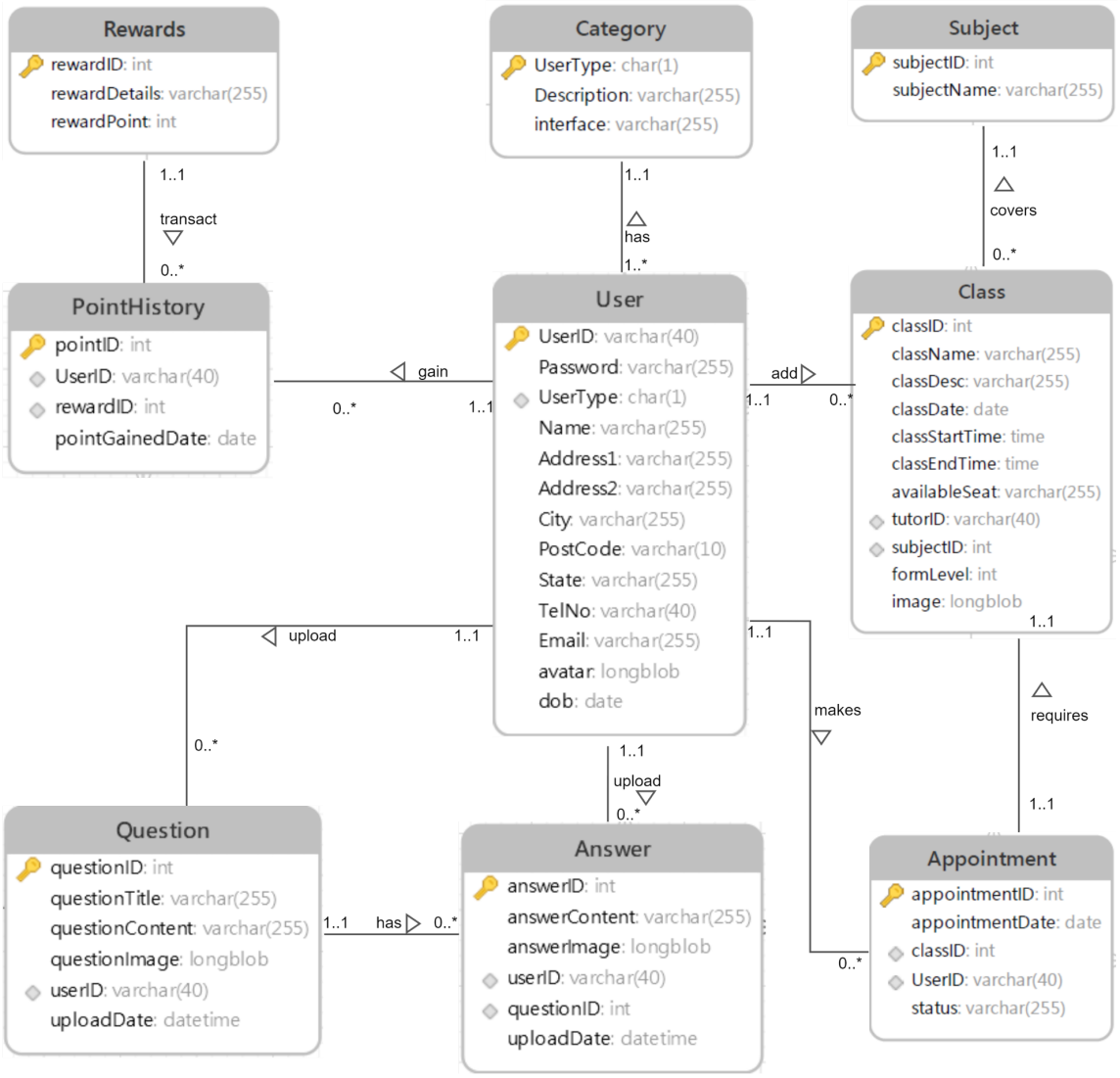


Figure 3.8.1: Entity-Relation Diagram for VOTION

Subsystem	Entity Name	Description
User	User	The entity consists of the data related to the personal details of users.
User	Category	The entity consists of the data related to the user type and its corresponding interface directed in the system.

Tuition	Class	The entity consists of the data related to the tuition class details.
Tuition	Subject	The entity consists of the data related to the subject list that is used to categorize the tuition class.
Tuition	Appointment	The entity consists of the data related to the tuition appointments made by the users.
Homework	Question	The entity consists of the data related to the questions information uploaded by the users.
Homework	Answer	The entity consists of the data related to the answers for the certain questions uploaded by the users.
Rewards	Rewards	The entity consists of the data related to the rewards and its corresponding points in the system.
Rewards	Point History	The entity consists of the data related to the point transaction of the users.

Table 3.8.1: Table of the subsystem and entity description in VOTION

3.9 Adaptation

The designed web application for VOTION is built with flexible code and a data structure that can be changed as the project proceeds. Each system function is decomposed into its own source code file. The system is designed to adapt to changes in any system function without causing other systems to malfunction. The data of the system is designed to be flexible enough for the necessary change in the future. For example, the user system is divided into two tables: the user table and the category table; if an extra role is required in the future, only the category table will be modified and the user table will not be affected.. The web application system is also adapted to different devices and allows users to execute the application on a variety of devices.

3.10 Verification

The verification of the system included the validation for the usability, functionality, compatibility, and reliability testing. In the beta testing, the product owner and the end user are invited to test the application environment. The blank box testing is a type of beta testing that is used to verify the functionality of a web application. The users performed the blank box testing with no prior knowledge of the system's internal structure. Traditional beta testing is used to ensure that the system is working properly. Only the product owner and the targeted users will have access to the software for testing purposes. In terms of usability, user feedback is gathered and the system is evaluated in light of it. The dependability and security concerns will also be evaluated during beta testing. For example, because all user information is encrypted, the data security risk is taken into account during beta testing. Furthermore, the web application's quality is determined by whether it achieves the product owner's objectives at this stage. All customer feedback and reviews will be taken into consideration and improved in future versions.

3.11 Personnel and Training

3.11.1 Web application personnel and training

The system interfaces are designed in a simple and consistent interface which is user friendly and simple to be used that allow the user to be eliminated for the web application training.

3.11.2 Education

As the volunteer tutor, they should sit for the national examination for fifth-form secondary school in Malaysia. They should be also equipped with the Malaysia Certificate of Education or Sijil Pelajaran Malaysia or any other higher education certificate. As the students, they should be equipped with the primary school achievement test certificate.

3.12 Packaging and Installation

At the earlier stage of the web application, the package files including the source code, documentation and the MySQL database are required to be downloaded. In order for the local web server to operate the web application, XAMPP local must be installed as the cross-platform for Apache and MySQL.

At the deployment stage, different packages are required to be installed. For instance, Apache web server, PHP 7.3 and MySQL, MariaDB are required to be downloaded in CentOS for web deployment.

The table below shows the packaging and installation for the web application.

Name	Mnemonic	Version
Operating System	Windows 10	Mobile Enterprise
Operating System	Linux	CentOS Linux release 8.5.2111
Browser	Google Chrome	96.0.4664.93
Browser	Microsoft Edge	96.0.1054.53
Browser	Mozilla Firefox	95
Browser	Safari	13.1.2
Programming Language	HTML	5
Programming Language	PHP	PHP 7.3.33
Programming Language	Javascript	ES2015
Database	MySQL	- 15.1 Distrib 10.3.28-MariaDB, for Linux (x86_64) - 10.4.21-MariaDB, for Windows (x64)
Database	phpMyAdmin	5.1.1-1.el8.remi
Database	Navicat	15.0.27
Web server	Apache	Apache/2.4.37 (centos)

Table 3.12.1: Table of the types and versions for the packaging and installation

4 Architecture Architecture

4.1 Architecture Overview

For our volunteering tutor application system, it can work everywhere as well as the internet is connected. The users for this application system are the students and the volunteer tutor. This application system is developed to help the student to solve the study problem and attend the tuition class for free of charge. Besides, the volunteer tutor also can have a platform for them to schedule the tuition class and help to solve the study problem of the students.

The main functions of this application system are to upload the questions asked together with the edit question by the student and view answers uploaded by the tutor. The student also can view the total reply of their uploaded question. Moreover, the user can use the search function to find the available classes by choosing the topic and the date-time which was created by the tutor. Once the student had added the classes. students can view their scheduled class with together viewing the class details and delete the scheduled class.

The main interfaces of this application system are the layout of this application, notification overview, the app bar for every type of the options and the search overview. The notification overview is for notifying the student the changes of their scheduled class in an easy way. The appbar of this system included home, profile, tuition class, schedule, homework, rewards and notification button. Before using the application, users need to enter their userID and the password at the login page. If the users have not been registered, they need to enter all the information at the register page and back to the login page once they have successfully registered. After they successfully login, they will enter the index page. Users can view their registered information at the profile page.

4.1.1 Logical architecture overview

The top level software components interact with each other in this web application. Linux is used as the operating system for web deployment. The phpMyadmin in CentOS is used to manage all the operations of MySQL and MariaDB. The web deployment utilizes the Linux distribution, This web application supports Linux, Windows, and macOS as operating systems.

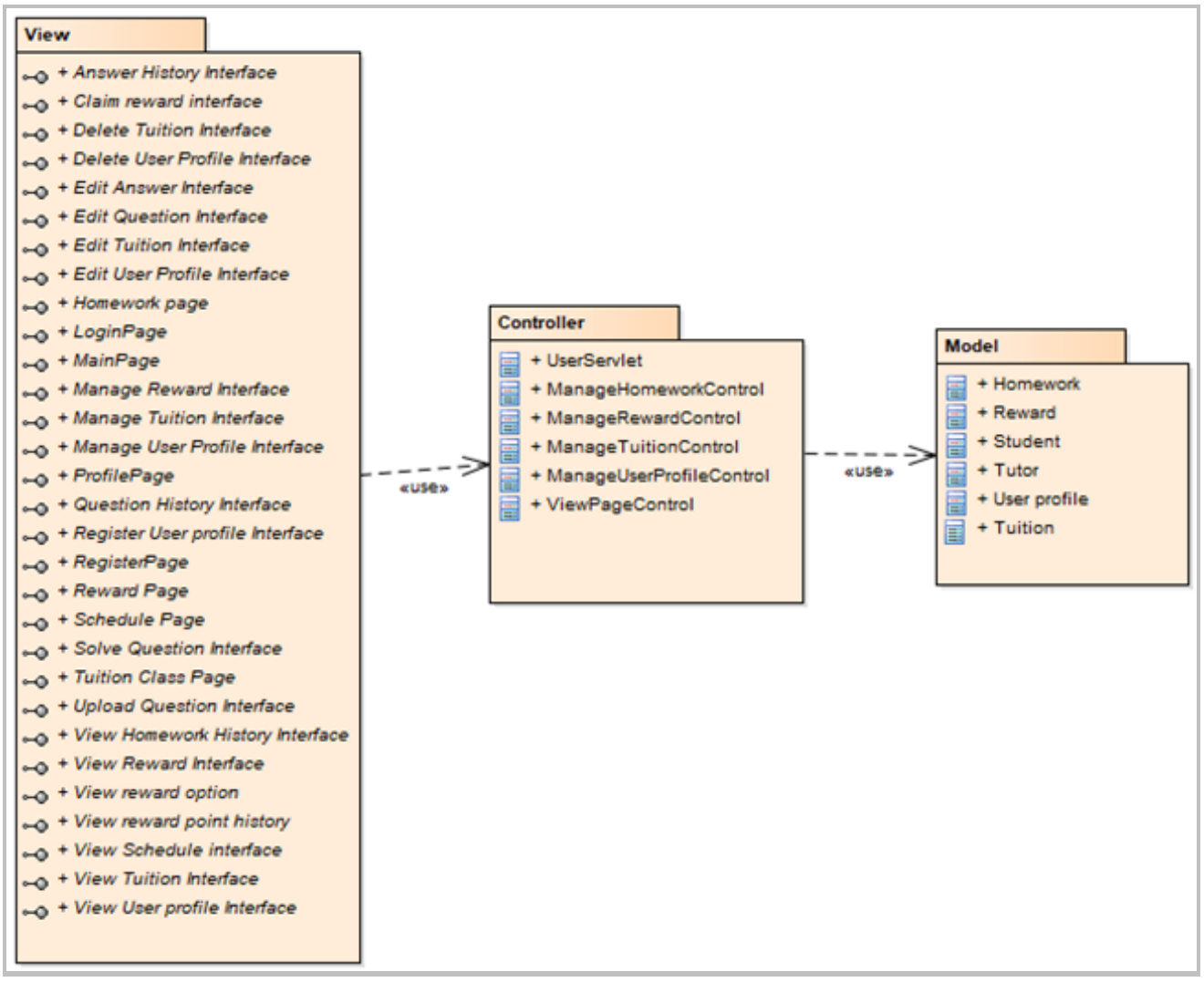
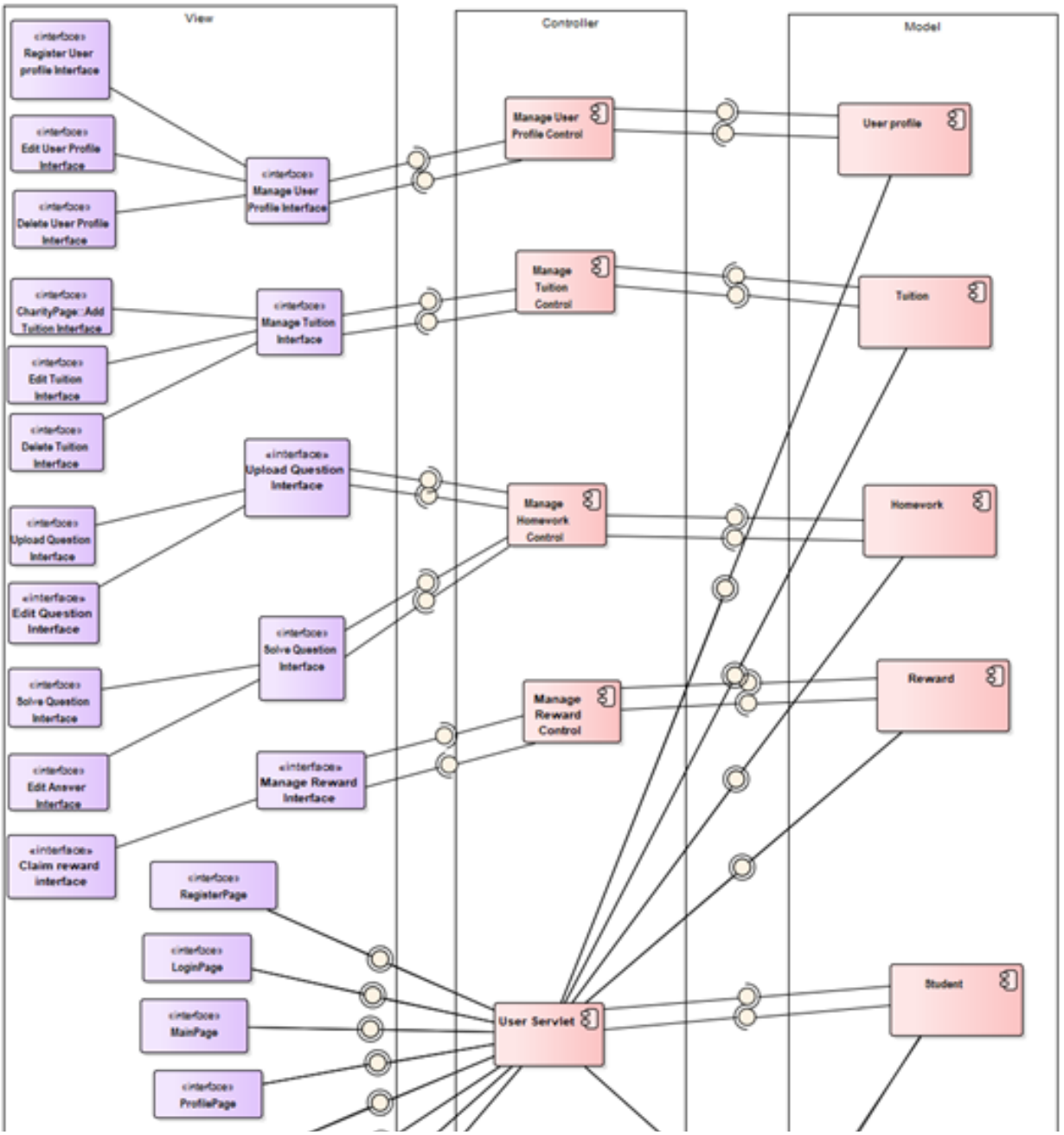


Figure 4.1.1 Package Diagram of Votion

4.1.2 Physical architecture overview

There are several hardware components supported for the web application. The web application is allowed to run in the browser with different types of hardware devices including laptops, personal computers and mobiles. The hardware components interact with the IDE such as the Visual Studio Code that is utilized in this system. The system's debugging, code refactoring, and compilation are all supported by the IDE.



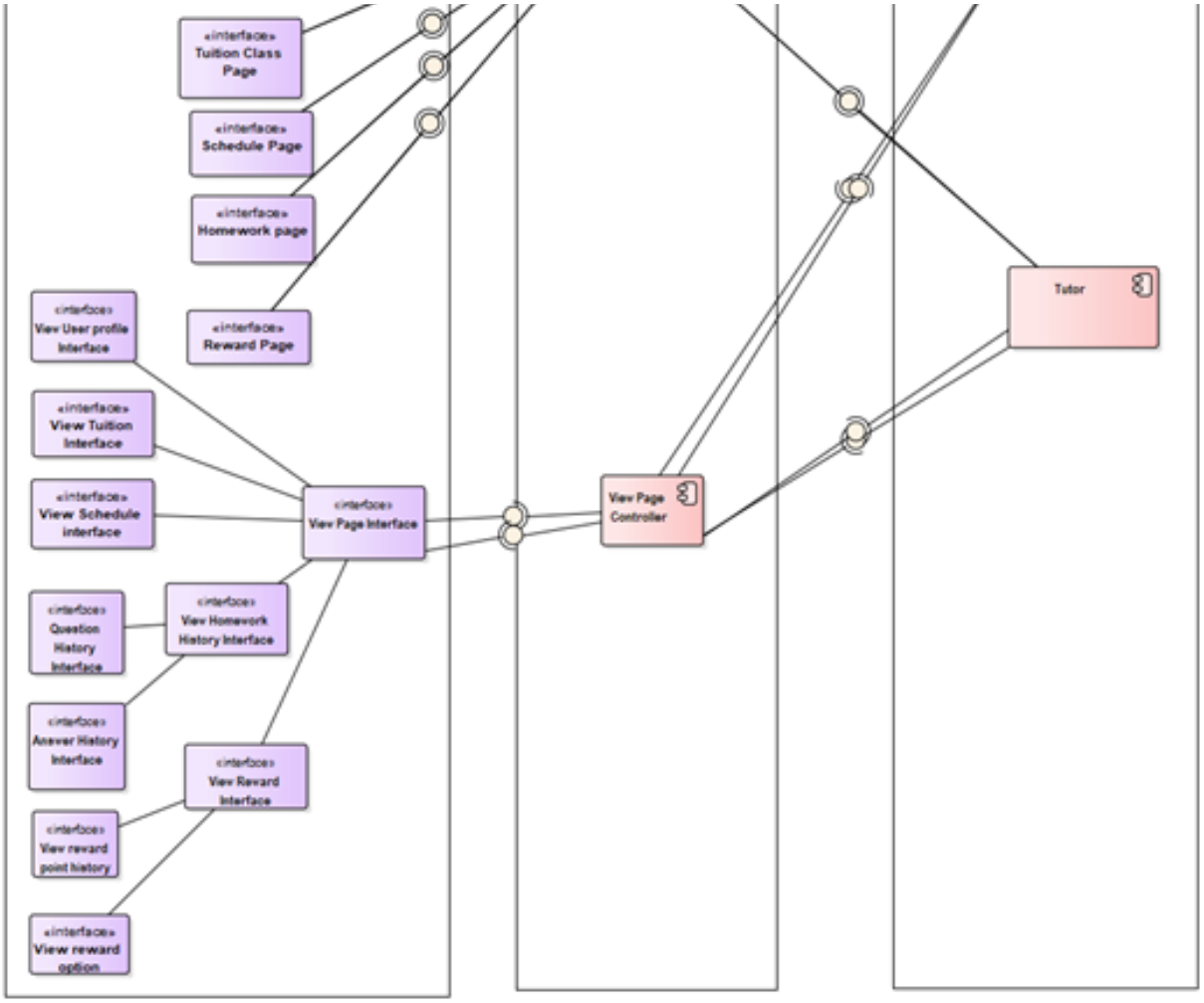


Figure 4.1.2 Component Diagram of Votion

5 Verification

5.1 Test Plan

5.1.1 Test environment

The Votion website is deployed to the Huawei Cloud system. Linux is used as the operating system while CentOS is the RPM-based Linux distributor for the web application. CentOs served as the package manager for the YUM in the Linux operating system. The version for the Linux is 4.18.0-348.2.1.el8_5.x86_64 and the version for the CentOS is CentOS Linux release 8.5.2111.

The memory used for the testing is 8.00GB RAM with Intel(R) Core (TM) i5-9300H CPU 2.40GHz, Windows 11 and NVIDIA GeForce GTX 1650. The type of the software and the hardware used to test the web application, Votion are stated as below.

Name	Mnemonic	Version
Operating System	Windows 10	21H2
Operating System	Windows 11	21H2 (10.0.22000.434)
Operating System	Linux	CentOS Linux release 8.5.2111
Browser	Google Chrome	96.0.4664.93
Browser	Microsoft Edge	96.0.1054.53
Browser	Mozilla Firefox	95
Database	phpMyAdmin	5.1.1-1.el8.remi
Web server	Apache	Apache/2.4.37 (centos)

Different types of test data are used for the test case, for example, no data, valid data, invalid data and illegal data. The invalid data and the extreme data is used to test the data validation. For example, the invalid data such as the password that does not reach the requirement as stated in the web application will not be allowed to proceed and will not be

stored in the database. Besides, if the illegal data is used for the test case, a warning will be prompt to the user to correct the specific data. Else, if there is no data entered by the user in the required space, a warning will be prompt to the user to enter the data. The test case will only be passed with the valid data set.

5.1.2 Customer/ field test site

The web application is tested in every sprint to fix the bugs detected. In Sprint 1 to Sprint 3, the product is run using localhost. The overall product in every sprint will undergo User Acceptance Testing with product owner and end user. The user acceptance testing in Sprint 1 until Sprint 3 is carried out by the group leader. The website link of the deployed product is provided to the product owner and end user for testing phase. Therefore, in Sprint 4 the user acceptance testing is carried out by the product owner and end user in their own places to test out two user types of data. Every bug detected will be recorded and to be discussed during the sprint progress meeting. All the results and progress are recorded in the logbook by every member.

5.2 Tests Description and Test Results

The users involved in the User Acceptance Testing are the product owner Miss Tan Xue Ying as a tutor user while the end user Mr Ng Rui Kang as a student user. The entire UAT process is recorded in the form of video for reviewing purposes. The results details are recorded in the UAT Table and Test Case Table.

Project Name:	Web Application for Volunteer Tutoring (VOTION)					
Last Updated:	13/01/2022	Release Date:	13/02/2022			
User Story	**Responsible Party**	**Priority**	**Test Date**	**Response**	**Comments**	**Description**
US001	Chiam Wooi Chin	HIGH	13/1/2022	Positive	fully functional	As a tutor/student, I want to register the profile by adding the user profile details so that I can join the online tuition system.
US002	Chiam Wooi Chin	MEDIUM	13/1/2022	Positive	fully functional	As a tutor/student, I want to edit the user profile details so that the user profile details are latest updated
US003	Chiam Wooi Chin	LOW	13/1/2022	Positive	fully functional	As a tutor/student, I want to delete the user profile so that I will no longer have the user profile in this online tuition system.
US004	Goh Jo Ey	HIGH	13/1/2022	Positive	fully functional	As a tutor/student, I want to add a tuition schedule so that I can arrange tuition classes with specific topics in the application as needed.
US005	Goh Jo Ey	MEDIUM	13/1/2022	Positive	fully functional	As a tutor/student, I want to edit my tuition schedule in the application so that I can adjust my tuition time as needed.
US006	Goh Jo Ey	LOW	13/1/2022	Positive	fully functional	As a tutor/student, I want to delete my tuition schedule so that I can cancel the tuition class if I have an emergency and cannot attend the class.
US007	Ng Jing Er	HIGH	13/1/2022	Positive	fully functional	As a student, I want to upload homework questions so that I can get help from an expert tutor to solve my academic problems.

US008	Ng Jing Er	MEDIUM	13/1/2022	Positive	fully functional	As a student, I want to edit the questions uploaded so that I can make changes on questions uploaded as needed.
US009	Ng Jing Er	MEDIUM	13/1/2022	Positive	fully functional	As a tutor, I want to answer the questions uploaded by students so that I can help them to solve their academic problems.
US010	Ng Jing Er	HIGH	13/1/2022	Positive	fully functional	As a tutor, I want to edit the answer uploaded so that I can make changes on the answer uploaded as needed.
US011	Ng Jing Er	LOW	13/1/2022	Positive	fully functional	As a student, I want to view the question history I have uploaded so that I can review the best answer for my question.
US012	Ng Jing Er	LOW	13/1/2022	Positive	fully functional	As a tutor, I want to view the answer history I have uploaded so that I can review my answers and others' for that question.
US013	Ong Yin Ren	HIGH	13/1/2022	Positive	fully functional	As a tutor/student I want to view my total rewards points so that I can review my total rewards points.
US014	Ong Yin Ren	MEDIUM	13/1/2022	Positive	fully functional	As a tutor/student, I want to view the details of the point history so that I can know how I earn the rewards point.
US015	Ong Yin Ren	LOW	13/1/2022	Positive	fully functional	As a tutor/student, I want to view the reward option available on this website so that I can get the information of the reward.
US016	Ong Yin Ren	LOW	13/1/2022	Positive	fully functional	As a tutor/student, I want to view claimable reward with my reward points so that I can claimed my rewards in an easy way

Test Title			Priority#	Test Case ID	Test Execution Date	
Test for UC001: Manage User Profile			1	TC-US001	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US001: Register User Profile			Chiam Wooi Chin		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	Enter the user profiles details	13/1/2022	Tutor/Student able to enter the user profiles details	Tutor/Student successfully enter the user profiles details	P	
02	Choose tutor or student option in the user type option input.	13/1/2022	Tutor/Student able to choose tutor or student option in user type.	Tutor/Student successfully chooses a tutor or student option in user type.	P	
03	Click save to register an user profile	13/1/2022	Tutor/Student able to click save to register user profile	User profile successfully registered	P	
04	Login to registered user profile	13/1/2022	Tutor/Student able to login to registered user profile	registered user profile successfully login.	P	

Test Title			Priority#	Test Case ID	Test Execution Date	
Test for UC002: Manage Tuition			2	TC-US004_01	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US004: Add Tuition(Tutor)			Goh Jo Ey		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the available tuition class on the Votion websites	13/1/2022	Tutor able to view the available class list in the “Tuition Class” interface	Available classes are successfully listed in the “Tuition Class” interface	P	
02	Enter the add tuition class interface by	13/1/2022	Tutor is directed to the “Add tuition class interface”	Tutor is successfully directed to the	P	

	clicking the add tuition class button			"Add tuition class interface		
03	Enter the details of the tuition class	13/1/2022	Tutor able to key in the details of the class required	Tutor successfully keys in the details of the class required	P	
04	Submit the entered add class details form by clicking the "Add Class" button	13/1/2022	Tutor successfully submit the add tuition class form	Tutor successfully submits the add tuition class form	P	
05	View the newly added tuition class on the tuition class	13/1/2022	Tutor able to view the newly added tuition class	Tutor successfully view the newly added tuition class	P	
06	View the tuition class details in the "My schedule" interface	13/1/2022	The newly added tuition class is listed in the "My schedule" interface	The newly added tuition class is successfully listed in the "My schedule" interface	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC002: Manage Tuition			2	TC-US004_02	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US004: Add Tuition(Student)			Goh Jo Ey		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the available tuition class on the Votion websites	13/1/2022	Student able to view the available class list in the "Tuition Class" interface	Available classes are successfully listed in the "Tuition Class" interface	P	
02	View the details of the specific tuition class by clicking the specific tuition class name	13/1/2022	Student able to view the details of the specific class	Student successfully views the details of the specific class	P	

03	Enroll to the desired tuition class	13/1/2022	Student able to enroll to the specific class	Student successfully enrolled to the specific class	P	
04	View the enrolled tuition class details in the "My schedule" interface	13/1/2022	Student able to view the updated enrolled class list	Student successfully views the updated enrolled class list	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC003: Upload Question			3	TC-US007	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US007: Upload Homework Questions			Ng Jing Er		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	view "Homework" interface by choosing "Homework" button in navigation bar	13/1/2022	Student is able to view the "Homework" interface.	Student redirected to "Homework" interface successfully	P	
02	view "Upload a Question" interface	13/1/2022	Student is able to view the "Upload a Question" interface	Student redirected to the "Upload Question" interface successfully	P	
03	upload a question by inserting the details	13/1/2022	Student is able to upload the details of the question required	Student's question uploaded successfully .	P	
04	view the homework question uploaded	13/1/2022	Student is able to view the details of the question uploaded.	Student viewed the details of the question uploaded successfully .	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC006: View Rewards Point			4	TC-US013	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US013: View the total Rewards Point			Ong Yin Ren		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	Choose the rewards interface	13/1/2022	Tutor able to click the rewards interface	Tutor successfully entered the rewards pag	P	
02	View the totals points	13/1/2022	Tutor able to view the total rewards point at the rewards page	Tutor able to view the total rewards point	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC001: Manage User Profile			5	TC-US002	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US002: Edit User Profile			Chiam Wooi Chin		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the user profile at Profile interface	13/1/2022	Tutor/Student able to view the user profile at Profile interface	Tutor/Student successfully view the user profile at Profile interface	P	
02	Click manage profile at Profile interface or change password at profile drop down navigation bar to edit user profile	13/1/2022	Tutor/Student able to Click manage profile at Profile interface or change password at profile drop down navigation bar	Tutor/Student successfully click manage profile at Profile interface or change password at profile drop down navigation bar	P	
03	Edit profile details or change	13/1/2022	Tutor/Student able to edit	Tutor/Student successfully	P	

	password by entering the profile details		profile details or change password by entering the profile details	edit profile details or change password by entering the profile details		
03	Click save to confirm submit updated user profile	13/1/2022	Tutor/Student able to click save to confirm submit updated user profile	User profile successfully updated	P	
04	View the updated user profile	13/1/2022	Tutor/Student able to view the updated user profile	Tutor/Student successfully view the updated user profile	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC002: Manage Tuition			6	TC-US005_01	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US005: Edit Tuition(Tutor)			Goh Jo Ey		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the details of the class owned by the tutor in “My Schedule” interface	13/1/2022	Tutor able to view the class list owned in the “My Schedule” interface	Tutor successfully views the class list owned in the “My Schedule” interface	P	
02	Edit the details of the specific class by clicking the details button	13/1/2022	Tutor is directed to the edit tuition class interface	Tutor is successfully directed to the edit tuition class interface	P	
03	Enter the desired information in the edit tuition class interface	13/1/2022	Tutor able to enter the desired class details in the form	Tutor successfully enters the desired class details in the form	P	
04	Update the tuition class by clicking the “Save” button	13/1/2022	Tutor able to submit the form with the updated details	Tutor successfully submits the form with the	P	

				updated details		
05	View the updated class details in the “My schedule” or “Tuition class” the interface	13/1/2022	Tutor able to view the updated class details	Tutor successfully views the updated class details	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC002: Manage Tuition			6	TC-US005_02	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US005: Edit Tuition(Student)			Goh Jo Ey		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the list of the class enrolled by the student in “My Schedule” interface	13/1/2022	Student able to view the class list enrolled in the “My Schedule” interface	Student successfully views the class list enrolled in the “My Schedule” interface	P	
02	View the details of specific the tuition class by clicking the “Details” button	13/1/2022	Student is directed to the enrolled class details interface	Student is successfully directed to the enrolled class details interface	P	
03	Edit the tuition class status by clicking the “Cancel” button	13/1/2022	Student able to click the cancel button	Student successfully clicks the cancel button	P	
04	View the updated status in the ”enrolled tuition class details” or “my schedule list” interface	13/1/2022	Student able to view the class details with updated status	Student successfully views the class details with updated status	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC004: Solve Question			7	TC-US009	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US009: Solve Homework Question			Ng Jing Er		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	view “Homework” interface by choosing “Homework” button in navigation bar	13/1/2022	Tutor is able to view the “Homework” interface.	Tutor redirected to “Homework” interface successfully	P	
02	view “Solve Question” interface	13/1/2022	Tutor is able to view the “Solve a Question” interface.	Tutor redirected to the “Solve a Question” interface successfully .	P	
03	view the full list of questions uploaded by different students	13/1/2022	Tutor is able to view the full list of questions by different students in the interface.	Tutor viewed the full list of questions by different students successfully.	P	
04	solve a question by inserting the details	13/1/2022	Tutor is able to upload the details of the answer.	Tutor’s answer was uploaded successfully .	P	
05	view the homework answer uploaded		Tutor is able to view the details of the answer uploaded.	Tutor viewed the details of the question solved and the answer uploaded successfully .	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC006: View Rewards Point			8	TC-US014	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US014: View the details of the rewards point			Ong Yin Ren		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	Choose the rewards interface	13/1/2022	Student able to click the rewards interface	Student successfully entered the rewards page	P	
02	Click the view point history button	13/1/2022	Student able to click the button	Student successfully enter the point history point	P	
03	View the detail of the point	13/1/2022	Student able to view the details	Student successfully view the details	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC002: Manage Tuition			9	TC-US006_01	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US006: Delete Tuition(Tutor)			Goh Jo Ey		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the list of the class owned by the tutor in “My Schedule” interface	13/1/2022	Tutor able to view the class list owned in the “My Schedule” interface	Tutor successfully views the class list owned in the “My Schedule” interface	P	
02	Edit the status of the class as “Deleted” by clicking the “Delete” button	13/1/2022	Tutor able to click the delete button	Tutor successfully click the delete button	P	

03	Confirm the delete process by clicking the delete button	13/1/2022	Tutor able to confirm/cancel the delete request	Tutor successfully confirms the delete request	P	
04	View the updated class status in the my schedule interface	13/1/2022	Tutor able to view the class details with updated status	Tutor successfully views the class details with updated status	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC002: Manage Tuition			9	TC-US006_02	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US006: Delete Tuition(Student)			Goh Jo Ey		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the list of the class enrolled by the student in “My Schedule” interface	13/1/2022	Student able to view the class list enrolled in the “My Schedule” interface	Student successfully views the class list enrolled in the “My Schedule” interface	P	
02	Delete the specific class by clicking the “Delete” button	13/1/2022	Student able to click the delete button	Student successfully clicks the delete button	P	
03	Confirm the delete process by clicking the delete button	13/1/2022	Student able to confirm/cancel the delete request	Student successfully confirms the delete request	P	
04	View the updated class list and the student is unenrolled from the class	13/1/2022	Student able to view the updated class list and the student is unenrolled from the class	Student successfully views the updated class list and the student is unenrolled from the class	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC005: View Question and Answer			10	TC-US011	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US011: View Question History			Ng Jing Er		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	view the "Question History" interface by choosing "View Q&A History" button in navigation bar	13/1/2022	Student is able to view the "Question History" interface.	Student redirected to "Question History" interface successfully	P	
02	view the table of question history	13/1/2022	Student is able to view the table of question history with details.	Student viewed the table of questions history with details successfully.	P	
03	display the list of questions uploaded and the total answer received respectively	13/1/2022	Student is able to view the list of questions uploaded and the total number of answer received respectively	Student viewed the list of questions uploaded and the total number of answer received respectively successfully.	P	
04	display the question upload date	13/1/2022	Student is able to view the questions latest uploaded date	Student is able to view the questions latest uploaded date successfully	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC005: View Question and Answer			11	TC-US012	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US012: View Answer History			Ng Jing Er		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	view the "Answer History" interface by choosing "View Q&A History" button in navigation bar	13/1/2022	Tutor is able to view the "Answer History" interface.	Tutor redirected to " Answer History" interface successfully	P	
02	view the table of answer history	13/1/2022	Tutor is able to view the table of his/her answer history	Tutor viewed the table of his/her answer history successfully.	P	
03	display the list of answer uploaded and the upload date respectively	13/1/2022	Tutor is able to view the list of answer uploaded with details and upload date respectively	Tutor viewed the list of answer uploaded with details and upload date respectively successfully.	P	

Test Title			Priority#	Test Case ID	Test Execution Date	
Test for UC007: Claim Rewards			12	TC-US016	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US015: View the claim rewards option			Ong Yin Ren		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	Choose the rewards interface	13/1/2022	Student able to click the rewards interface	Student successfully entered the rewards page	P	
02	View the rewards option with the green border	13/1/2022	Student able to view the available rewards option	Student successfully know which can be claimed	P	

Test Title			Priority#	Test Case ID	Test Execution Date	
Test for UC001: Manage User Profile			13	TC-US003	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US003: Delete User Profile			Chiam Wooi Chin		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	View the user profile at Profile interface	13/1/2022	Tutor/Student able to view the user profile at Profile interface	Tutor/Student successfully view the user profile at Profile interface	P	
02	Click manage profile at Profile interface or profile drop down navigation bar to edit user profile	13/1/2022	Tutor/Student able to Click manage profile at Profile interface or at profile drop down navigation bar	Tutor/Student successfully click manage profile at Profile interface or at profile drop down	P	

				navigation bar		
03	Click 'Delete Profile?' to delete user profile	13/1/2022	Tutor/Student able to click 'Delete Profile?' to delete user profile	Tutor/Student successfully click 'Delete Profile?' to delete user profile	P	
03	View the delete confirmation interface	13/1/2022	Tutor/Student able to view the delete confirmation interface	Tutor/Studentsuccessfully view the delete confirmation interface	P	
04	Enter correct password to confirm delete user profile	13/1/2022	Tutor/Student able to enter correct password to confirm delete user profile	Correct password successfully entered to confirm delete user profile	P	
05	Click 'ok' to confirm delete user profile	13/1/2022	Tutor/Student able to click 'ok' to confirm delete user profile	Tutor/Student successfully click 'ok' to confirm delete user profile	P	
06	Cannot login deleted user profile	13/1/2022	Tutor/Student not able to login deleted user profile	Deleted user profile is not successfully login	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC003: Upload Question			14	TC-US008	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US008: Edit Uploaded Question			Ng Jing Er		Ng Rui Kang	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	pick a question uploaded to edit	13/1/2022	Student is able to view the details of question uploaded before editing	Student viewed the details of question uploaded	P	

				successfully before editing		
02	view the "Edit Question" interface by clicking edit question button	13/1/2022	Student is able to view the "Edit Question" interface.	Student redirected to "Edit Question" interface successfully	P	
03	send email to user involved	13/1/2022	Student is able to send email to a particular user involved.	Student sent the email to a particular user involved successfully.	P	
04	edit the details of question uploaded	13/1/2022	Student is able to edit the details of the question uploaded	Student edited the details of the question uploaded successfully	P	
05	view the updated homework question by clicking save button	13/1/2022	Student is able to view the updated homework question after clicking save button	Student viewed the updated homework question successfully after clicking the save button .	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC006: Solve Question			15	TC-US010	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US010: Edit Uploaded Answer			Ng Jing Er		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	pick a answer uploaded to edit	13/1/2022	Tutor is able to view the details of question solved and the answer uploaded before editing	Tutor viewed the details of question solved and the answer uploaded successfully before editing	P	
02	view the "Edit Answer" interface	13/1/2022	Tutor is able to view the "Edit	Tutor redirected to	P	

	by clicking edit answer button		answer ” interface.	“Edit answer ” interface successfully		
03	send email to user involved	13/1/2022	Tutor is able to send email to a particular user involved.	Tutor sent the email to a particular user involved successfully.	P	
04	edit the details of answer uploaded	13/1/2022	Tutor is able to edit the details of the answer uploaded	Tutor is able to edit the details of the answer uploaded successfully	P	
05	view the updated homework question by clicking save button	13/1/2022	Tutor is able to view the updated homework answer after clicking save button	Tutor is able to view the updated homework answer successfully after clicking the save button .	P	

Test Title			**Priority#**	**Test Case ID**	**Test Execution Date**	
Test for UC007: Claim Rewards			16	TC-US015	13/1/2022	
Test Description			**Test Designed by**		**Test Executed by**	
Test for US015: Claim the rewards			Ong Yin Ren		Tan Xue Ying	
Step ID	**Step Description***	**Test Date**	**Expected Results^**	**Actual Results**	**Pass (P) / Fail (F)**	**Additional Notes**
01	Choose the rewards interface	13/1/2022	Tutor able to click the rewards interface	Tutor successfully entered the rewards page	P	
02	Click the claim button that are enough with the total point	13/1/2022	Tutor able to click the button	Tutor successfully claimed the rewards and go to the profile page	P	

6 Requirements Traceability

This table gives the traceability between requirements and tests, and the method of test.

Use Case ID, User Story ID	Use Case Description	Test Case ID	Test Description
UC001, US001	Manage User profile(Register User Profile)	TC-US001	Tutor/student is able to register user profile
UC001, US002	Manage User profile(Edit User Profile)	TC-US002	Tutor/student is able to edit user profile
UC001, US003	Manage User profile(Delete User Profile)	TC-US003	Tutor/student is able to delete user profile
UC002, US004	Manage Tuition (Add Tuition)	TC-US004_01	Tutor is able to add tuition class,
		TC-US004_02	Student is able to enroll to tuition class
UC002, US005	Manage Tuition (Edit Tuition)	TC-US005_01	Tutor is able to edit tuition class details,
		TC-US005_02	Student is able to edit enrolled tuition class status
UC002, US006	Manage Tuition (Delete Tuition)	TC-US006_01	Tutor is able to delete tuition class owned,
		TC-US006_02	Student is able to delete the enrolled/ canceled tuition class from the list
UC003, US007	Upload Question (Upload Homework Question)	TC-US007	Student is able to upload a homework question
UC003, US008	Upload Question (Edit Uploaded Question)	TC-US008	Student is able to edit the uploaded question
UC004, US009	Solve Question (Solve Homework Question)	TC-US009	Tutor is able to solve a homework question
UC004, US010	Solve Question (Edit Uploaded Answer)	TC-US010	Tutor is able to edit the uploaded answer
UC005, US011	View Question and Answer (View Question History)	TC-US011	Student is able to view question history
UC005, US012	View Question and Answer (View Answer History)	TC-US012	Tutor is able to view answer history
UC006, US013	View Rewards Point (Total point)	TC-US0013	Tutors and students shall be able to view their total reward points
UC006, US014	View Rewards Point (Details of the point)	TC-US0014	Tutors and students shall be able to view their details of the reward points
UC007, US015	Claim Rewards (Claim Reward)	TC-US0015	Tutors and students shall be able to claim their reward points in the application.
UC007, US016	Claim Rewards (View Claimed rewards option)	TC-US0016	Tutors and students shall be able to know which rewards option can be claimed in the application.