PARAGON
INTERNATIONAL UNIVERSITY
C A M B O D I A

Paragon Computer Science C.I.G.N.A.L A Web Application Of A Course Audit System To Evaluate Graduation Requirements For Computer Science Department

Bachelor's Thesis

Chi Phong KANG

2023

PARAGON COMPUTER SCIENCE C.I.G.N.A.L A WEB APPLICATION OF A COURSE AUDIT SYSTEM TO EVALUATE GRADUATION REQUIREMENTS FOR COMPUTER SCIENCE DEPARTMENT

A Capstone thesis

Presented to the

Faculty of Information and Computer Technology

Paragon International University, Cambodia

In Partial Fulfillment

of the Requirements for the Degree of

Bachelor of Science in Computer Science

by

Chi Phong KANG

June 2023

Date of submission: 27 June 2023

THESIS APPROVAL

This research entitled PARAGON COMPUTER SCIENCE C.I.G.N.A.L A WEB APPLICATION OF A COURSE AUDIT SYSTEM TO EVALUATE GRADUATION REQUIREMENTS FOR COMPUTER SCIENCE DEPARTMENT prepared and submitted by CHI PHONG KANG in partial fulfilment of the requirement for the degree BACHELOR OF SCIENCE IN COMPUTER SCIENCE has been examined and recommended for acceptance and approval for oral examination.

NEIL IAN C. UY, MSIT
FYP Instructor

_____

PANEL OF EXAMINERS

Approved by the Panel on Final Oral Examination on <u>27 June 2023</u> with grades of

_____ (CHI PHONG KANG).

RATANA SOTH, MSITE
Adviser

NEIL IAN C. UY, MSIT
Head of Department for
Computer Science

MR. MENHSEAN KEANG
Internal Technical Examiner

Accepted and approved by the Dean of the Faculty of Information and Computer Technology for the degree BACHELOR OF SCIENCE IN COMPUTER SCIENCE.

MEIRAMBEK ZHAPAROV, PhD
Dean
Faculty of Information and Computer Technology

DISCLAIMER

I hereby declare that this Bachelor's Thesis is my own original work and has not been submitted before to any institution for assessment purposes.

Further, I have acknowledged all sources used and have cited these in the reference section.

27 June 2023

……………………..   ……………………

Chi Phong Kang   Date

DEDICATION

The researcher would like to express my heartfelt dedication in this research study to the following individuals:

First and foremost, the researcher extends his deepest gratitude to his parents, whose unwavering support and sacrifices enabled the researcher to pursue higher education despite the financial challenges. Their belief in the potential and their commitment to my academic journey have been invaluable.

The researcher also extended his appreciation to his siblings, whose constant encouragement and support have played a significant role in his academic pursuits. Their belief in the researcher's abilities and their unwavering encouragement have been a source of motivation throughout my educational journey.

Lastly, the researcher would like to acknowledge and thank the individuals who have been an integral part of his life and have shown unwavering trust and support in my academic endeavors. Their belief in me has inspired the researcher to push beyond his limits and strive for excellence.

To all these individuals, the researcher is deeply grateful for their love, trust, and encouragement throughout this academic journey. This research study is a testament to their unwavering support and the profound impact they have had on my life.

ACKNOWLEDGEMENTS

The researcher would like to extend his sincerest appreciation and acknowledge the invaluable contributions of his supervisor, Mr. Neil Ian Uy, without whom this study and thesis would not have been possible.

The researcher is also immensely grateful to the esteemed panelists, namely Mr. Neil Ian Uy, Mr. Ratana Soth, and Mr. Menhsean Keang, for their valuable time and constructive feedback during my defense. Their presence made the defense a truly enjoyable and memorable experience that will be cherished for years to come.

Special thanks go to all friends in the department who provided unwavering emotional support throughout the research stages of this project. Your encouragement and camaraderie have been invaluable.

The researcher would also like to express my heartfelt gratitude to his family and loved ones for their constant support and care during the research process. Your unwavering belief in the researcher has been a driving force throughout this journey.

Finally, the researcher would like to acknowledge his own dedication and perseverance. Pushing beyond his limits and remaining resolute, the researcher has successfully concluded another significant chapter in his life that spanned four years.

ABSTRACT

The purpose of this study is to create a system named "Course Audit System". The system can be used by students to validate their eligibility for graduations. By inputting their grades to the courses in each semester they can learn more about their academic progress and see if they're going to be eligible for graduation. The admin side is able to manage the study plans for students and manage courses within the study plans.

EXECUTIVE SUMMARY

Problem	Finding	Conclusion	Recommendation
What are the requirements along: A. Functional Requirements	Based on the discussion with the computer science department and the responses from students, the functional and non-functional requirements were formed. Functional requirements: CGPA calculation, Count courses taken by type, Credit calculation, Failed Courses, Manage Students, Manage Courses, Manage Study-Plan, Assign Study Plan, Logging, Student's Dashboard, Student Update Grades	The system must implement the following requirements: CGPA calculation, count courses taken by type, credit calculation, failed courses, manage students, manage courses, manage study plan, assign study plan, logging, student's dashboard, student update grades.	Authentication being the same as the school's system it would be more convenient for the user The system can evolve to check the actual student's grades The system can use the API of the school's system or be imported to the school's system in the future.
B. Non-Functional Requirements	Non-Functional requirements: Usability, Operation, Performance, Security, Accessibility	The system should also be intuitive and user friendly. Internet connection is essential to use the system. The system features must work quickly with no delay. Authentication and authorization must be implemented and passwords are encrypted.	

| What data do students need to be conscious of their expected time of graduation? | Based on the responses from students the data collected indicates that students need to know the following: CGPA: students are interested in knowing the required CGPA for graduation eligibility. General Course Requirement: student wants to know the minimum requirements for each type of course. Students want to know this to help them meet the necessary course requirements for graduation. Credit: Students consider credit requirements to be crucial information for their timely graduation. They want to be aware of the number of credits needed to fulfill the requirements of their program. Retake: students want to know the courses that they need to retake. By knowing what courses to retake, it can help them avoid any obstacles that might delay their graduation. | Based on the responses from students the data collected indicates that students need to know the following: CGPA, General Course Requirement, Credit, Retake. | The data used to answer this question was from CS junior and sophomore. In future studies, a larger population of study would be more insightful and see if other departments think differently. |

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATION

CS stands for Computer Science

ALM stands for Application Lifecycle Management

UTAUT stands for Unified Theory of Acceptance and Use of Technology

GPA stands for Grade Point Average

CGPA stands for Cumulative Grade Point Average

HOD stands for Head of Department

SDLC stands for Software Development Lifecycle

SRS stands for Software Requirement Specification

SDA stands for Software Design and Architecture

CRUD stands for Create, Read, Update, and Delete

API stands for Application Programming Interface

CPU stands for Core Processing Unit

C.I.G.N.A.L stands for Can I Graduate Now After Levels

CHAPTER I

Background of the Study

In university, some students would say it is the best time of their lives. Some students regard it as the most memorable phase of their lives, where they are afforded the opportunity to engage with new experiences and people. But it is not always fun, they face many challenges during their time in the university. One of the challenges was to meet the requirements and graduate.

Universities have distinct criteria that students need to fulfill to be eligible for graduation. Several educational institutions in the United States have developed their own advising systems to provide guidance to students. These systems assume the role of an advisor and aim to assist students in determining the courses they need to take to meet the requirements.

In Cambodia, universities may have a pre-planned route for students to take or an advisor to help the students. As shown in table 1, students in these well-known universities other than ParagonIU in Cambodia said that they do not use a system to assist students.

Universities	Results
Institute of technology of Cambodia	No system for students
National University of Management	No system for students
Royal University of Phnom Penh	No system for students
CamEd Business School	System show only number of courses and credits student has
Norton University	No system for students

Table 1. Data of Different Universities

Every student needs to keep track of their course requirements in order to graduate. However, the process of checking and planning to meet the requirements is often time-consuming and inconvenient. [1] provided that manual process in handling academic auditing leads to the poor data integrity and time consuming.

Departments	How students keep track of their progress
CS	Spreadsheets
MIS	None
ARC	None
CE	None
BUS	None
ITL	None
IE	None

Table 2. How Students Track Progress in Different Departments

In ParagonIU, almost all of the departments do not provide the students with a way of tracking their progress and students have to keep track by themselves. As shown in table 2, the CS department students do the tracking via a spreadsheet. With the spreadsheet, most of the process will be done manually. Hence, the students have expressed that the way they are doing it can be time consuming and they wish there can be an easier way. Figure 1 shows the process of course auditing via a spreadsheet.
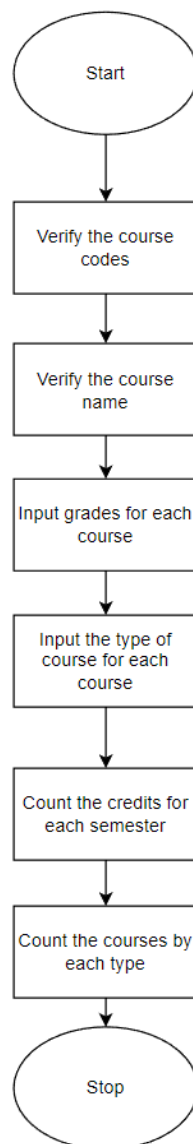
Figure 1. Current Process of Auditing via Spreadsheet

As shown in Figure 1, [2] shows each step of the process has to be done manually. Verifying the courses taken, inputting the grades for each course. After that they still have to count the amount credits they have and the amount of foundation courses, core courses, department elective courses, and general elective courses.

A system to solve this problem would need the right functions and requirements. [3] stated that due to automated academic record systems still being a fairly new development, only a handful of studies have been conducted on how to create the systems, let alone how to improve them. With only a few studies conducted, the researcher needs to focus on the data gathered from the students and the head of department.

The process is also a complicated one because there are different criteria you have to meet in order to meet the graduation requirements. [4] provided that the complexity arises because of the multiple requirements that a student has to meet and the various ways in which each of these requirements can be satisfied. This is one of the main reasons why the process can be time consuming.

Statement of the Problem

This study aims to build a system that helps the ParagonIU students plan and keep track of their course requirements by answering the following question:

1. What are the requirements of the course audit system along
    a. Functional requirements and
    b. Non-functional requirements?
2. What data do students need to be conscious of their expected time of graduation?

Significance of the Study

For Paragon International University, the study will provide detailed information on what system is needed and how it can be used effectively. It will provide the requirements for the system and the system for Paragon International University.

For HOD, this study can be a platform that the HOD can introduce to the students for them to keep track by themselves. This study will let the HOD set the requirements for the students and help them keep track of the students in the department

For students, the study will help the students work on the audit process to see if they satisfy the requirements. It will also help the students to have a more convenient auditing process.

For other researchers, this study can be used for future reference. The researchers can try to improve and expand on the study or they can use it as a source of information related to the study they are conducting.

Scope and Limitations

This study focuses on making a system that would be more convenient for the students to keep track of their academic progress. To be specific, the system in this study will allow the students to keep track of their progress with their assigned study plans. The administrator can be the head of the department, will be able to manage many things, such as, create accounts, create curriculum, create study plans, assign study plans to students, and so forth. The system will also help the students know if

they are at risk of not finishing their study before their preferred year.

For the limitations, the system will not be connected to the ParagonIU system. It will be a standalone system without any connection to the school's system at all due to the privacy of the school's system. The system uses the requirements of the CS department and if the requirements are to change in the future, the system has to be modified. The study has to be done before the end of semester two, which means it is a time constraint for the researcher

.

Definition of Terms

Promote Students. In this study, this means the student is promoted to another year level. For example, a freshman is promoted to be a sophomore

Academic Year. In this study, it refers to the year the student enrolled in.

Theoretical Framework

In this study, the researcher will use the following theories:

Application Lifecycle Management (ALM)

According to [5], ALM provides a framework for setting requirements and establishing processes, governance and methodologies before deploying software. ALM improves the quality of product by frequent and thorough testing. Thus, ALM supplies the scaffolding within which software gets developed, tested and maintained.
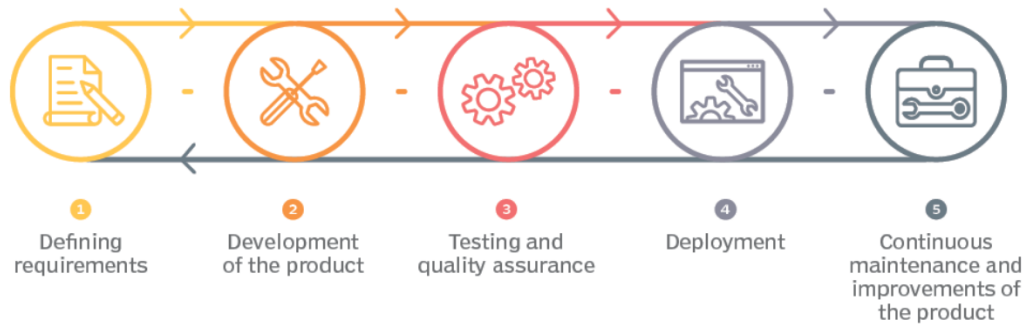
Figure 2. Application Lifecycle Management Framework

This study will benefit from following the ALM process, which provides a comprehensive approach to manage the entire lifecycle of an application. By following ALM, the researcher can ensure that all phases of the study, including planning, development, testing, deployment, maintenance. This approach will enable the researcher to identify the study's objectives and requirements, design and develop a system that meets those requirements, test and deploy the system, and maintain it throughout the study. Ultimately, following the ALM approach will contribute to the success of the study and ensure that the system built for it is of high quality and meets the needs. As we can see in Figure 2 the ALM consists of:

- Defining requirements: during this stage the researcher will discuss with the head of the CS department to gather the requirements. Once the requirements are gathered. The researcher will analyze it and document the requirements into the Software Requirement Specification (SRS), which will be used to describe what the product needs to fulfill. The requirements can be changed effectively as the situation changes.

- Development of the product: This stage can start once the requirements are agreed. It progresses from an idea and design it to be a working application. The researcher will create a development plan and follow the plan to build the

system. The design of the system will be documented in the SDA. The SDA will consist of design goals, system behavior, and different views on the system.

- Testing and quality assurance: In this stage, the researcher must ensure that the application meets all the requirements defined in the first stage. The system will be tested to be free of bugs and other issues. The testing will be done on localhost before it is deployed. The testing can happen multiple times and during development. This stage is finished once the product meets the quality and is good enough for deployment.

- Deployment: This is the stage where the product is released to the users. The researcher will host the system built so the users can try out the system independently.

- Maintenance: Once the application is deployed the maintenance occurs. During this stage, the researcher resolves any issue that occurs after the deployment.

The scope of ALM is more comprehensive than the SDLC. The main difference between them is that the SDLC focuses mainly on the development process and the ALM covers requirements, development, testing, deployment, and maintenance.

Unified Theory of Acceptance and Use of Technology (UTAUT)

In this study, the researcher has chosen the UTAUT framework because By using UTAUT, the researcher can gain insights into why users may or may not adopt a particular technology.

The actual use of the technology is determined by behavioral intention in the model of UTAUT. [6] stated that the perceived likelihood of adopting the technology is dependent on the direct effect of four key constructs, namely performance expectancy, effort expectancy, social influence, and facilitating conditions. The effect of predictors is moderated by age, gender, experience and voluntariness of use.

The researcher starts by developing a survey questionnaire that includes items related to each of the four constructs. The questionnaire is then administered to a sample of participants who are potential users of the technology being studied.

Performance expectancy is the level that an individual believes that using the system will help the individual to achieve better job performance. The researcher will need to measure the efficiency through the use of the system and its usefulness.

Effort expectancy is the level of ease related to the use of the system. The researcher will measure the use of the system by the ease of use, if it is a stress free interaction with the system, and how easy it is to learn the system.

Social influence is the level an individual thinks that other people should also use the new system. The researcher will measure if the individual thinks it's useful for others and how likely they will recommend the system. Some individuals might use the system because they are required to do so, not because of personal preference.

Facilitating conditions are when the researcher measures the availability of the system. The researcher will measure to see if the system is running properly when the user is using it.

As we can see in Figure 3, Gender affects the performance expectancy, effort expectancy, and social influence. Age affects all four key constructs. Experience affects effort expectancy, social influence, and facilitating conditions. Voluntariness of use affects the social influence.
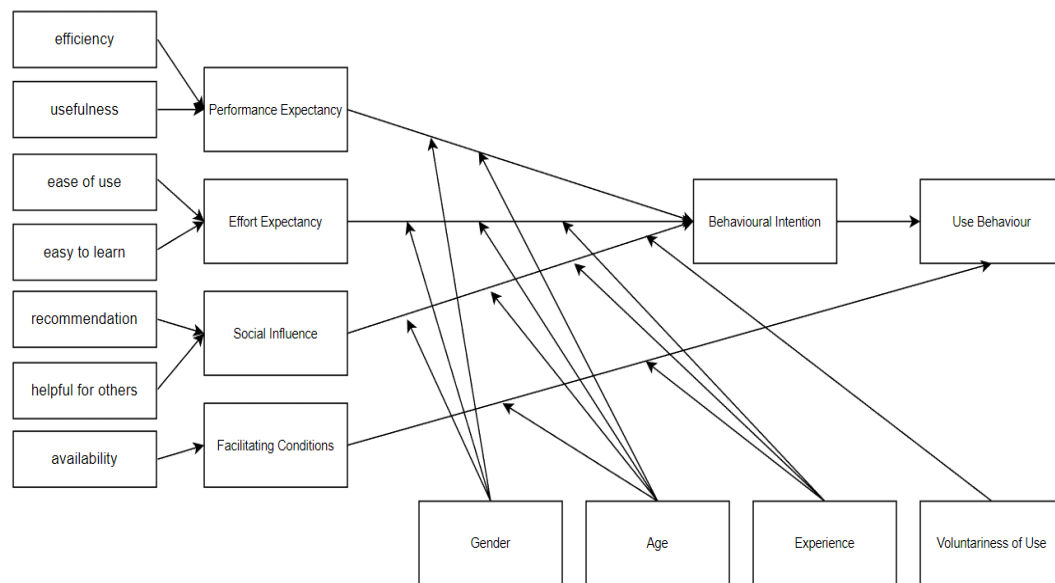
Figure 3. Unified Theory of Acceptance and Use of Technology

Conceptual Framework

Conceptual Framework for the Entire Study

With the theoretical frameworks above, the researcher can combine both frameworks together to create a framework for this study. The framework will show each stage of the study from the beginning until the end.

As we can see from Figure 4, The researcher adopts the ALM framework as a guideline for the development and testing of the system in this study. However, the researcher customizes the ALM framework to suit the needs of this study. The framework consists of five stages that include defining the requirements, system development, testing, deployment, and acceptance testing. The researcher will first define the requirements of the system, then proceed to develop and test it for any bugs. Once the system is free of bugs, it will be deployed and ready to be used. The final stage of the framework is acceptance testing, where the researcher will apply the UTAUT framework to assess the respondents' acceptance of the system. The

researcher modifies the ALM framework to fit this study's objectives, ensuring that

the system's development and acceptance testing process are comprehensive and

effective.
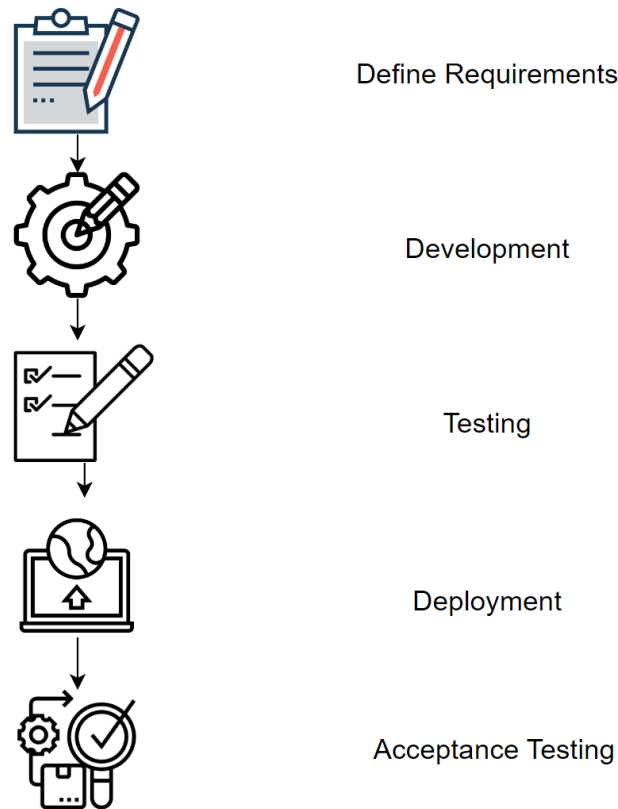
Figure 4. Conceptual Framework

The first stage is Define Requirements, where the researcher will determine

the specific requirements of the system based on the data gathered to identify the

necessary features and functions of the system.

The second stage is Development, where the actual system is developed based

on the identified requirements. This stage involves designing the system. After the

design is done, the development of the system can start.

The third stage is Testing, where the system will undergo several rounds of

testing to ensure that all features and functions are working properly. This stage is done to identify and fix any issues or bugs.

  The fourth stage is Deployment, where the system will be launched and made available for use by the users.

  The fifth and final stage is Acceptance Testing, where the researcher will conduct acceptance testing on the selected respondents. This stage involves gathering feedback from the users on the usability, functionality, and overall effectiveness of the system.

Conceptual Process of the System
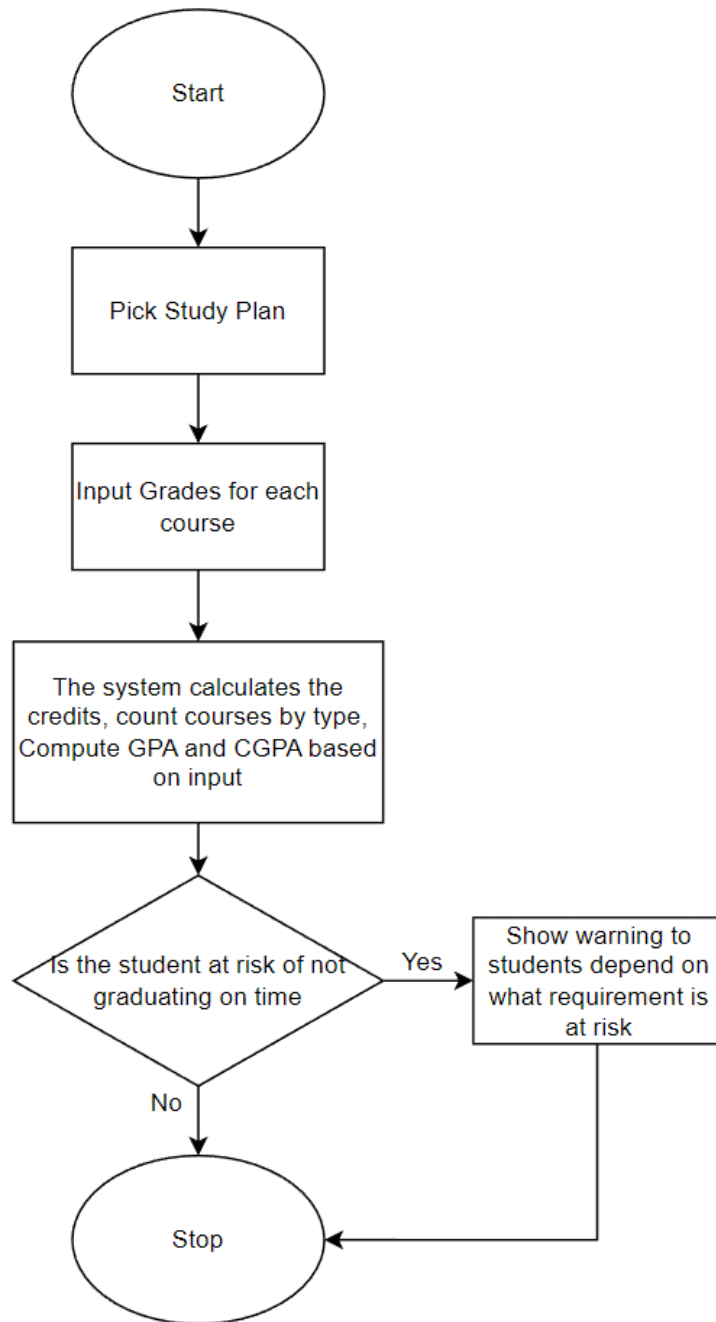
Figure 5. Conceptual Process of the System

Figure 5 provides a simplified and more efficient process for students to audit their courses using the system. With the automation of the auditing process, students no longer have to do everything manually to keep track of their course requirements, which can be time-consuming and inconvenient. Instead, they can easily input their

grades into the system and have the system check if they are meeting the necessary requirements for graduation. Furthermore, the system goes beyond just tracking and provides helpful warning to the students, helping them stay on the right track towards graduation. This streamlines the process for students, making it easier for them to focus on their studies and academic success.

Review of Related Literature

[1] stated that the student academic audit process is one of the crucial activities in higher learning institutes. Due to this, they came up with the Graduation Audit Reporting System (GARS). All courses that were taken including credit exemption will appear on GARS. GARS will automate the process of events involved in the academic audit process in a way that it will imitate the process involved in the current traditional method yet eliminates the physical aspect of the process. It provides a final confirmation of degree requirements.

[7] provides us with information about the courses and requirements in Paragon International University. Each course is graded by the letter grade and grade points. A course can be graded from AA to F. More details on Table 3.

Letter Grade	Grade Points	Meaning
AA	4.0	Outstanding Work – among the very best students in the course
BA	3.5	Excellent Work
BB	3.0	Very Good Work
CB	2.5	Good Work
CC	2.0	Satisfactory Work – Minimum Unconditional Passing Grade
DC	1.5	High Conditional Pass (cannot ever be used to satisfy prerequisite requirement unless approved by academic advisor)
DD	1.0	Low Conditional Pass (cannot ever be used to satisfy prerequisite requirement unless approved by VR Academic Affairs)
F	0.0	Fail
NP	0.0	Not Present – failure due to not taking the final examination.
GP	**	Grade Pending
IC	**	Incomplete
W	**	Withdrawal
T	**	Transfer; credit for course work done at another institution.
P / NC	**	Pass (for Pass / No Credit course only)

Table 3. Course Grades

Each course has its own number of credits and with their grades,[7] provided us how to calculate the Grade Point Average (GPA). The total grade points divided by the total factorable credits equals the GPA. See example:

A student's record in one semester might be:

3 credits in History (AA)   3cr × 4.00 grade points = 12.00 grade points.cr

4 credits in Physics (FF)   4cr × 0.00 grade points =   0.00 grade points.cr

3 credits in Engineering (BA) 3cr × 3.50 grade points = 10.50 grade points.cr

$$\frac{(12.00 + 0.00 + 10.50)\,grade\ points\,.\,cr}{(3 + 4 + 3)cr} = \frac{22.50}{10}\,grade\ points$$

$$= 2.25\ Grade\ Point\ Average$$

Paragon International University uses GPA to refer to semester grades and uses Cumulative Grade Point Average (CGPA) for all the semesters of a student. For the graduate requirements, students must complete their course requirements and have CGPA 2.00 or above for all courses taken with a minimum of 132 credits.

[8] defined Degree Audit is a system used to automatically check a student's progress in their chosen degree program(s). The literature also lists down what a student can expect in the degree audit system:

- Header Information: displays student information for that specific degree audit.

- Requirements: The main body of the audit includes a statement about the overall status of the audit and as well as each requirement with details. With each requirement having sub-requirements to them.

- Status Indicators and Legend: the status indicator is seen with the requirements to indicate whether it is completed or not. The legend provides a description of various symbols you may see throughout the audit.

[9] has provided that The Early Alert, student success initiative, is designed as a timely intervention for students who are having academic difficulty at any point during the academic semester. They believe that helping students early would help the student succeed.

The Early Alert features include:

- Provides a quick and easy web-based interface for instructors

- Provides more detailed alert information from instructors

- Consolidates and summarizes student, course and alert data for

advisors

- Provides information to student services offices to assist engaging students with Early Alert details

- Automatically notifies the student via email that an early alert has been submitted

- Gives faculty ongoing access to early alert status

One of the main objectives of this program is to improve student academic success. The program relates to this study because both the program and this study are trying to help students succeed and doing so by helping the students early.

Research Design and Methodology

The mixed methods and applied research approach are applied to this study. According to [10], Applied research is a non-systematic way of finding solutions to specific problems or issues. These problems or issues can be on an individual, group, or societal level. It is called "non-systematic" because it goes straight to finding solutions.

Mixed methods can help you gain a more complete picture than a standalone quantitative or qualitative study, as it integrates benefits of both methods [12]. In this study, the qualitative method will be used first to gather requirements. By employing qualitative research, the researcher aims to obtain a comprehensive understanding of the needs and requirements of the system. Since it is applied research, the study focuses on finding the solutions. Which means the researcher will not be targeting the data from the majority to gather the requirements, instead the focus will be on the quality data. This way of research helps the researcher to gather the required data and

what is necessary. The quantitative method will be used later on to find out if the system built is working as intended.

Population and Locale of the Study

The respondents for this study are the Department of Computer Science and the Computer Science junior and sophomore students. The reason why the researcher chose the Computer Science department is because in the Paragon International University they are the most familiar with course auditing. The sophomore students will be less experienced in the course auditing, while the junior students will be more familiar with it because they need to do it before entering their senior year. Therefore, they are the population that will be the most helpful for this study.

After the system is finished, the group of testers will not be limited to the CS department. Students from other departments can also test it.

Data Gathering Tools

The researcher mainly uses two data tools to find solutions to the problems. The data gathering tools are focus group discussion, survey, and questionnaire.

The focus group discussion is conducted with the Department of Computer Science. The discussions are held multiple times both online and offline. The agenda of the meeting:

- List down the requirements
- Analyze the requirements
- Define specific requirements

After the discussion, a survey will be conducted on students. By understanding the students' viewpoints and preferences, the survey seeks to identify the specific data points that students consider crucial in navigating their academic journey effectively and attaining timely graduation.

After the group discussion and questionnaire, the requirements for the system are gathered. The system will be built and tested. Once the system is finished, the researcher will conduct the user acceptance testing using UTAUT to the group of chosen students for their feedback. A questionnaire will be made for the students. The questionnaire will be asked in the form of likert scale questionnaire. A Likert scale is a numerical scale where users rate their reaction to a statement [11]. In this questionnaire, the researcher will use the most common likert scale to gather information from the students. The rating scale will start from strongly disagree (1) to strongly agree (4). The statement in the questionnaire will aim to figure out the students' reaction to the system on the efficiency, usefulness, ease of use, if it is easy to learn, will they recommend the system, do they think it is useful for other students, and availability.

Data Gathering Procedures

Firstly, the researcher prepared letters of request to get the approval from the Dean of ICT Faculty, and the Head of the Department of Computer Science. The letters mentioned that the study will be conducted in Paragon International University and to gather necessary information for the study.

Secondly, the researcher will do focus group discussion with the CS department. It will be through Discord and on campus. The data gathered from the

discussion will be used to list down the specific requirements for the system. Many questions related to the study are asked to the CS department. This process happens multiple times in order to fully understand the specific requirements and what needs to be done.

Thirdly, the researcher will conduct a survey on students. The purpose of this survey is to find out what data that students consider important to help them meet their graduation requirements.

Lastly, a questionnaire will be conducted on the students after they test the system. The responses will be documented to see if they find the system to be useful and it is working as intended.

Treatment of Data

To answer the first research question, which is about the functional and non-functional requirements. The researcher carefully analyzes the data gathered from the discussions with the Head of the Department of Computer Science and the data gathered from students to form the requirements for the system. The reason for discussing with the CS HOD is more than to gather requirements but to ensure that the developed system meets the required technical standards. Since the discussions were done multiple times. The researcher has to revise, understand and connect each session together to form an answer to the research question.

To answer the second question, the researcher has to gather data from students and understand what type of data the students need to know. With different types of courses, each type has to be fulfilled, CGPA needs to be above 2.0 and the amount of credits need to be equal or above requirement in order to graduate. The data that will be shown to the students need to be helpful for them. The amount of credits, amount

of courses taken, types of courses, and CGPA are what needs to be considered to be able to alert students.

Organization of the Study

Project Milestones and Timeline

Semester 1												
Project Milestones/ Time	December				January				Febuary			
Week	1	2	3	4	1	2	3	4	1	2	3	4
Preliminary Investigation	▮											
Background of the study		▮	▮									
Statement of the problem				▮	▮							
Significance of the study					▮							
Theoretical Framework						▮	▮	▮	▮	▮		
Conceptual Framework						▮	▮		▮	▮		
Review of related literature						▮	▮	▮	▮	▮		
Research Design and methodology						▮	▮	▮				
Organization of the study											▮	

Semester 2																
Project Milestones/ Time	March				April				May				June			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Requirements Gathering		▮	▮													
Designing the sytem			▮	▮												
Build the system					▮	▮	▮	▮	▮	▮						
Testing									▮	▮	▮	▮				
Deployment													▮			
User acceptance testing													▮	▮		
Finish up															▮	▮

Figure 6. Project Milestones and Timeline

CHAPTER II

DATA PRESENTATION

Discussion with Computer Science Department

The discussion with the CS department was conducted to carefully form and analyze the specifics requirements of the system. The discussions have led to these important details:

- The system should be able to identify math courses while it can also be a core, department electives, or other types of courses at the same time.

- Students have year levels which act as access control for them to only input grades on specific semesters.

- Core and math courses will be considered failed if the grades are DD or lower and the system must be able to identify that.

- The system must be able to assign a study plan to an academic year and to students. If a student or a group of students are unable to follow the study plan of that academic year, a special plan can be assigned to them.

- The system must have a log that tells which students changed their grades at which time.

- A department elective or general elective course can be added in multiple semesters of one study plan, as it can be offered in a different semester for students.

Responses from Students

Students' responses to the question, "What are the important information that you need to know in order to help you meet the graduate requirements on time?"

Responses	Label
- Courses they need to take and the credits - Credit Amount - Amount of credits. Amount of specific type of courses. Avoid certain grade to not retake. - Credit needed of the course - Total all the credit for the student - Have the right amount of credits - The number of credit, the number of core courses to satisfy the requirement, the number of department elective to satisfy the requirement, the number of general electives to satisfy the requirement, how many retake courses. - Amount of credits they currently have - About the requirement credit and course need to take in order to complete the graduation - The amount of credit for each course and to know what the core courses are - the number of credits for graduation in their program. - Credit Requirements Students must understand the specific number of credits required for graduation in their program. - The number of credits necessary for graduating. - check if you have enough credit to graduate - the required credit, courses that I need to complete - Number of credit I already have and the remaining credits that I need. - The number of credits they need to gain. - Knowing you have enough credit or not how many you need to pass and an easy way for student to calculate their own credit or the system calculated for them	Credit
- The amount of credits, GE, DE, and Core courses required to graduate. - The courses they have already taken and the ones they need to take - What the core courses are, how many credits are required, - How many course they need to study and a minimum grade to pass each course - Graduation requirements including course requirements - The important courses that are required for graduation - Number of courses taken - Clear course requirements such as the core and elective course.	General Course Requirements

● The number of core courses and DE they need to complete. ● I think it based on individual's wellness in each course whether they passed all the classes and get enough credits to graduate or not. ● Amount of Courses ● Course Requirements like how many we have to take	
● Minimum gpa requirements and credit requirements ● GPA, study performance, grade requirements ● Number of credits needed, GPA requirement, for CS all courses must be DC or higher, number of elective courses required, which year they're currently in ● Student has to know their CGPA is it enough for graduate or not one more is about the credit which is meet the requirements of school or not. ● The requirements ● I think students need to know the required grade to pass their studying year, as well as the required credit scores, GPA ● The required GPA to graduate, The required credit to be able to graduate ● Degree requirement	CGPA
● Allow student to repeat on time like if student fall Cal 1 so let them take with Freshman or either open one class for student who fail. ● Retaking course ● know how school grading system work and know fail courses. ● Know which course they have to retake and the amount of credit they take is enough for graduate. ● retaking courses and the amount of courses to take ● Knowing the number of credits that I've attained from the courses I've taken, which specific courses that are required for graduation, which courses to retake in case I do not meet certain conditions. ● Credit and retake course	Retake

Table 4. Students' Response

Table 4. displays the responses obtained from students regarding the important

information needed to meet graduate requirements on time. Each response has been

carefully analyzed and labeled by the researcher to facilitate the analysis process.

Among the responses, the majority demonstrate a high level of quality and provide

valuable insights.

The most frequently assigned labels in the table are (1)Credit with 18 responses labeled, (2)General Course Requirements with 12 responses labeled, (3)CGPA with 8 responses labeled, and (4)Retake with 7 responses labeled. These labels help categorize the responses and provide a better understanding of the information sought by the students.

The **CGPA** label indicates that students are interested in knowing the required Cumulative Grade Point Average (CGPA) for graduation eligibility.

The **General Course Requirements** label reflects the students' desire to understand the minimum requirements and passing grades for various types of courses. Some responses specifically mention core courses, department electives, or general electives, while others emphasize a broader understanding of course requirements. Despite the variation in the specific course types mentioned, all responses in this category highlight the significance of meeting the necessary course requirements for graduation.

The **Credit** label signifies that students consider credit requirements to be crucial information for their timely graduation. They want to be aware of the number of credits needed to fulfill the requirements of their program and ensure they are on track to meet those requirements.

The **Retake** label indicates that students are interested in identifying courses that may need to be retaken. This suggests their concern for successfully completing courses and avoiding any obstacles that might delay their progress towards graduation.

User Acceptance Testing Responses

The researcher used the UTAUT framework. Students were asked about different factors such as their age, performance, effort, social influence, facilitating

conditions, experience, and voluntariness. This approach allowed for a comprehensive

analysis of the students' viewpoints and provided valuable insights into their

interactions with the system.

Age		
	freq	Weighted Mean
Students	44	20.86

Table 5. Students' Age

Table 5 provides data on the age distribution of the students. The frequency

count indicates that there were 44 students included in the study. The mean age

calculated from the data is 20.86 years, representing the average age of the student

participants.

Performance					
	Strongly Agree	Agree	Disagree	Strongly Disagree	
	freq	freq	freq	freq	Weighted Mean
I can input my grade to each course quickly	24	20	0	0	3.54
I can save my grades quickly	25	18	1	0	3.58

Table 6. Performance

Table 6 presents data on the performance of the system based on students'

responses to specific statements. The data includes frequency counts for each

response category (Strongly Agree, Agree, Disagree, and Strongly Disagree) and the

mean score for each statement.

For the statement "I can input my grade to each course quickly," 24 students

strongly agreed and 20 students agreed, while no students disagreed or strongly

disagreed. The mean score for this statement is 3.54, indicating a relatively high level of agreement among the students.

Similarly, for the statement "I can save my grades quickly," 25 students strongly agreed and 18 students agreed. One student disagreed, and no students strongly disagreed. The mean score for this statement is 3.58, again suggesting a positive response from the students.

Effort					
	Strongly Agree	Agree	Disagree	Strongly Disagree	
	freq	freq	freq	freq	Weighted Mean
I find the system easy to use	15	28	1	0	3.31
Learning to use the system was easy for me	23	19	2	0	3.48

Table 7. Effort

Table 7 provides data on the perceived effort required to use the system based on students' responses to specific statements. It includes frequency counts for each response category (Strongly Agree, Agree, Disagree, and Strongly Disagree) and the mean score for each statement.

Regarding the statement "I find the system easy to use," 15 students strongly agreed and 28 students agreed. One student disagreed, and no students strongly disagreed. The mean score for this statement is 3.31, indicating a generally positive perception of the system's ease of use among the students.

For the statement "Learning to use the system was easy for me," 23 students strongly agreed and 19 students agreed. Two students disagreed, and no students strongly disagreed. The mean score for this statement is 3.48, suggesting that most students found it relatively easy to learn how to use the system.

Social Influence					
	Strongly Agree	Agree	Disagree	Strongly Disagree	
	freq	freq	freq	freq	Weighted Mean
I would recommend the system for others.	21	23	0	0	3.48
I think the system would be helpful for others	25	19	0	0	3.57

Table 8. Social Influence

Table 8 presents data on the social influence of the system based on students' responses to specific statements. It includes frequency counts for each response category (Strongly Agree, Agree, Disagree, and Strongly Disagree) and the mean score for each statement.

For the statement "I would recommend the system for others," 21 students strongly agreed and 23 students agreed. No students disagreed or strongly disagreed. The mean score for this statement is 3.48, suggesting a generally positive inclination among the students to recommend the system to others.

Similarly, for the statement "I think the system would be helpful for others," 25 students strongly agreed and 19 students agreed. No students disagreed or strongly disagreed. The mean score for this statement is 3.57, indicating that the students believe the system would be beneficial for others.

Facilitating Conditions					
	Strongly Agree	Agree	Disagree	Strongly Disagree	
	freq	freq	freq	freq	Weighted Mean
I can use the system on my browser without any problems	19	24	1	0	3.41
The system is running smoothly	21	21	2	0	3.43

Table 9. Facilitating Conditions

Table 9 presents data on the facilitating conditions of the system based on students' responses to specific statements. It includes frequency counts for each response category (Strongly Agree, Agree, Disagree, and Strongly Disagree) and the mean score for each statement.

Regarding the statement "I can use the system on my browser without any problems," 19 students strongly agreed and 24 students agreed. One student disagreed, and no students strongly disagreed. The mean score for this statement is 3.41, indicating a generally positive perception of the system's usability on browsers among the students.

For the statement "The system is running smoothly," 21 students strongly agreed and 21 students agreed. Two students disagreed, and no students strongly disagreed. The mean score for this statement is 3.43, suggesting that the majority of students perceive the system to function without significant issues or disruptions.

Experience					
	Strongly Agree	Agree	Disagree	Strongly Disagree	
	freq	freq	freq	freq	Weighted Mean
Using the system enables me to accomplish the audit quickly	19	25	0	0	3.43
I would find the system useful to help me check my academic progress.	24	19	1	0	3.52

Table 10. Experience

The table 10 presents data on the students' experience with the system based on their responses to specific statements. It includes frequency counts for each response category (Strongly Agree, Agree, Disagree, and Strongly Disagree) and the mean score for each statement.

For the statement "Using the system enables me to accomplish the audit quickly," 19 students strongly agreed and 25 students agreed. No students disagreed or strongly disagreed. The mean score for this statement is 3.43, indicating that the majority of students believe that the system facilitates swift completion of audits.

Regarding the statement "I would find the system useful to help me check my academic progress," 24 students strongly agreed and 19 students agreed. One student disagreed, and no students strongly disagreed. The mean score for this statement is 3.52, suggesting that the system is perceived as beneficial for monitoring and evaluating academic progress.

Voluntariness of Use					
	Strongly Agree	Agree	Disagree	Strongly Disagree	
	freq	freq	freq	freq	Weighted Mean
I want to use the system	24	20	0	0	3.54

Table 11. Voluntariness of Use

Table 11 presents data on the voluntariness of using the system, based on students' responses to a specific statement. It includes frequency counts for each response category (Strongly Agree, Agree, Disagree, and Strongly Disagree), as well as the mean score.

For the statement "I want to use the system," 24 students strongly agreed, and 20 students agreed. No students disagreed or strongly disagreed. The mean score for this statement is 3.54, indicating a positive inclination among the students to voluntarily use the system.

1. **What are the requirements of the course audit system along**

   a. Functional Requirements

After analyzing the data gathered from the students and having multiple discussions with the head of department, the functional requirements of the system are formed. The table below shows the system's functional requirements.

ID	Requirements name	Description
FR1	CGPA calculation	Calculate the amount of CGPA students that they have and show the minimum requirement
FR2	Count courses taken by type (ex, Core Course …)	Calculate the amount of courses taken by each type and show the required amount
FR3	Credit calculation	Calculate the amount of credits of students and show the amount of required credit
FR4	Failed Courses	Identify and show the courses students

		failed.
FR5	Manage Students	Admin is allowed to create, edit, and delete a student's account.
FR6	Manage Courses	Admin is allowed to create, edit, and delete a course.
FR7	Manage Study-Plan	Admin is allowed to create,set requirements for each course type, add and remove courses from study plan, and delete a study plan
FR8	Assign Study Plan	Admin is allowed to assign a study plan to an academic year, and to specific students
FR9	Logging	Admin is able to see which student has updated their grades at which time.
FR10	Student's Dashboard	Student immediately sees the failed courses if there's any and show the amount of courses completed by type
FR11	Student Update Grades	Students can input grades for each course and save the grades. Once it is saved their data will be updated.

Table 12. Functional Requirements

b. Non-functional Requirements

The table below shows the system non-functional requirements.

ID	Requirement name	Description
NFR1	Usability	The system should be intuitive and user-friendly. It should be easy to navigate
NFR2	Operation	Internet connection is essential to use the system. It runs up anytime anywhere.
NFR3	Performance	All features of the system should be quick with no delay.
NFR4	Security	Secure authentication, access control, and passwords are encrypted.
NFR5	Accessibility	Able to access on web browser, and even a responsive design on mobile device(Mobile Web)

Table 13. Non-functional Requirements

2. What data do students need to be conscious of their expected time of graduation?

The responses from students in Table 4 demonstrate consistent quality, providing valuable insights into the information students perceive as important for meeting graduate requirements on time. The analysis of these responses helps identify common themes and highlights the significance of factors such as CGPA, General Course Requirements, Credit, and Retake in students' understanding of the graduation process.

CHAPTER III

TECHNICAL SPECIFICATION

Software Requirements Specification (SRS)

1. General Design Constraints

1.1. Product Environment

The Course Audit System is an autonomous system that has been constructed utilizing the PHP web framework, specifically Laravel, which establishes connections with a MySQL database and is integrated with the Bootstrap front-end framework. The system is intended for utilization through a web browser and incorporates inherent authentication support.

1.2. User Characteristics

- The Department is responsible for managing the students, viewing student details, and controlling what they can see. The department can also create, manage and delete a student. They are expected to have a basic understanding of technology.

- Students are able to see their own study plans, input their grades based on their current year level, and see the courses they will be taking in the future. They are expected to have a basic understanding of technology.

1.3. Mandated Constraints

While developing the Course Audit System, there were no specific requirements regarding the programming language, database management system, or web framework. The most important constraint during project implementation was the allotted time. This means that the project needs to be completed quickly and efficiently. The constraint of the system is the student may input fake grades into the system.

1.4. Potential System Evolution

Here are some ways to improve the system:

- Better user interface: By enhancing and introducing an interactive interface, the system will not only have a more visually appealing appearance but will also offer improved user-friendliness.

- Authentication with actual account from ParagonIU

- Check with the actual grade from the university system.

- Using API or import with the system of ParagonIU.

- Automatic memory scalability: if the system were to be expanded further and used by many devices. Automatic memory scaling would be recommended.

2. Nonfunctional Requirements

2.1. Usability Requirements

The Course Audit System should be designed to be intuitive and user-friendly for both students and admins. It should be easy for students to find where they can input their grades and calculate their CGPA quickly. Similarly, admins should have no trouble assigning study plans and managing students effortlessly.

2.2. Operational Requirement

The Course Audit system requires an internet connection since it does not support offline use. The system functions as a web application and can be accessed on any browser. It is essential for the system to operate seamlessly, without encountering any errors, for both administrators and students.

2.3. Performance Requirements

The system should start in less than 5 seconds. When a user uses the program, the interface responds quickly to the user's needs. If the internet connection is slow, the system may take longer to load.

2.4. Security Requirements

The security requirements for the system are:

- Authentication to prevent unauthorized users

- Access control, only admin accounts are able to manage other users.

- Access control for students: they are only allowed to edit grades on courses up to their study year.

- All user's account passwords are encrypted.

- Firewall is implemented to protect the system.

2.5. Safety Requirements

The system is designed to be safe for users to use. The only safety concern is the hardware, the system will work on a browser so a mobile phone can be damaged if the users are accessing the system during rain.

2.6. Ethical Considerations

The system prioritizes user data security by employing encryption techniques to hash and store user passwords in the database, ensuring that passwords are never stored in plain-text, and user data is strictly utilized solely for the purpose of delivering the expected features and functionalities of the system. The data of the users are very important and they have to be considered while building the system and not let the data of the users fall to unauthorized and unauthenticated users.

2.7. Other Quality Attributes

The system allows administrators to create a student's account, courses, study plans, and are able to manage all of them. Courses can be added into a study plan, then a study plan can be assigned to students through their academic year. The administrator can also assign a different study plan for students who don't follow the main study plan.

The system will also work on a mobile device, the students will not have any problems inputting their grades with the user interface responsive to the mobile browser.

2.8.   Documentation and Training

The system is designed to be easy to use and requires minimal effort necessary to learn how to use the system. A user journey is also included.

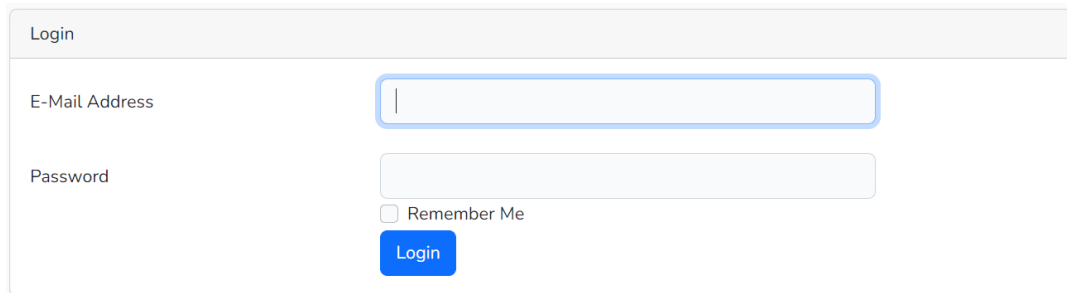### 2.9.   External Interface

2.9.1.   User Interface

The user's interface should be compatible with browsers, such as Google Chrome, Firefox, Microsoft Edge, etc. The look of the system is minimal and straightforward. Users should be able to easily see and navigate to where they want to be. An average user without training can learn the main features of the system quickly. If the user is a student, they should learn it in less than 2 minutes. If the user is an admin they should learn it in less than 5 minutes.

2.9.2.   Software Interface

The Course Audit System operations will use the HTTP protocol for communications between the client and server through the internet

3. System Features

3.1. Feature: Authentication

Figure 7. Login page

- Description and Priority

This is an important part of the system as the system will need to authenticate users before they can use the system. All parts of the system verify if the user is authenticated and authorized.

Cost: medium, Risk: high, Value: high.
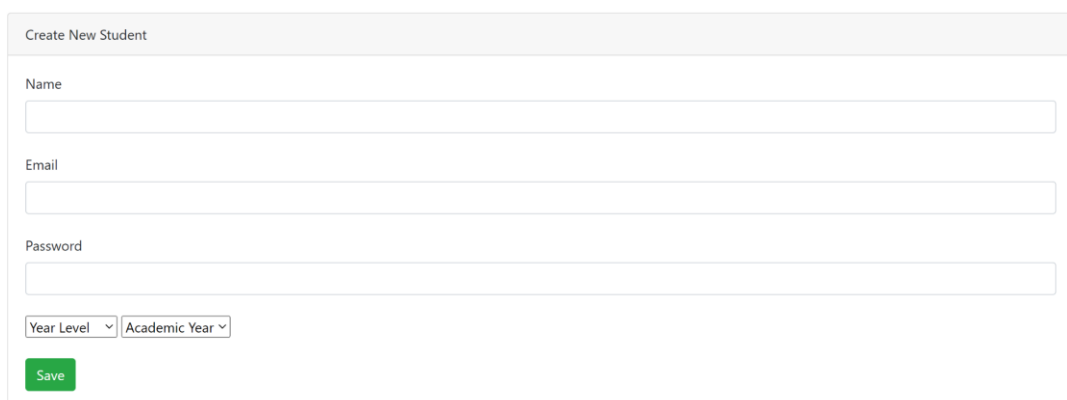
- Use Case: Login

Validate users before granting access to the system.

- Use Case: Log out

Validated users exit the system and are no longer able to access the system until they log in again.

3.2. Feature: Registration

Figure 8. Register Students Page

- Description and Priority

Registering new accounts are only available to the administrator. The account is needed in order to access the system.

Cost: medium, Risk: high, Value: high.

- Use Case: Create Account

Email, passwords, academic year, and year level are assigned to the student's account. The student then can use the created account to log in and access the system.

- Additional Requirements

People without access are not allowed to create an account.

3.3. Feature: Manage Students

Figure 9. Manage Students Page

- Description and Priority

Managing students is an important part of the system. With details of the students are important because the details of the students can affect the features that are accessible to the students.

Cost: medium, Risk: medium, Value: medium.

- Use Case: View Student's Grades

The administrator can view the grades that students have input, they can also view the courses taken, amount of courses taken by each type, failed courses, CGPA, and amount of credits of the students.

- Use Case: Edit Students

Every detail of a student can only be edited by the administrator. Details such as, their name, year level, academic year, email address, and password.

- Use Case: Unassign Custom Study Plan

If a student is given a custom study plan that is different from other students in the same academic year, it can be removed by an administrator and the student will have the study plan that is assigned to their academic year.

- Use Case: Promote Students

Students can be promoted by the admin and their year level will be increased.

- Use Case: Delete Students

A Student's account can be deleted by an administrator.

3.4. Feature: Courses

Figure 10. Courses Page

- Description and Priority

Courses are important to the system, as the course itself and the details of the course are needed to be added into a study plan.

Cost: low, Risk low, Value: medium.

- Use Case: Create Course

Only the administrator can create a course. By filling out the course details such as, course name, code name, credit, and type of course.

- Use Case: Edit Course

Once the administrator created a course, it can be edited if the administrator wishes to. All the details of a course can be updated after the course is created.

- Use Case: Delete Course

The administrator is able to delete the courses they have created.

3.5.   Feature: Academic Year

Figure 11. Academic Year Page

- Description and Priority

Academic Year is what is needed to assign a study plan. A student is able to access their study plan through their academic year.

Cost: low, Risk: low, Value: medium.

- Use Case: Create Academic Year

Academic year is created by an administrator. There is no form filled out to create an academic year as it will be created by just a push of a button. The year created will always be incremental.
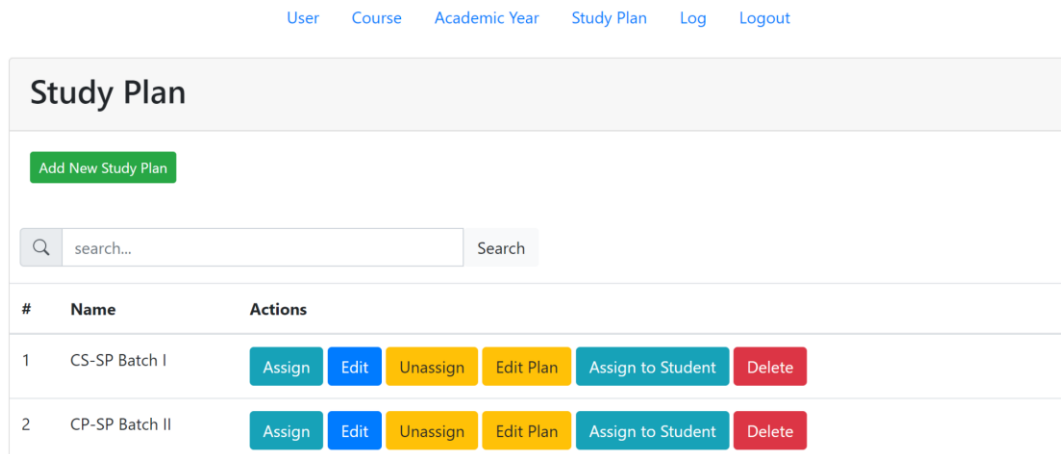
3.6. Feature: Study Plan

Figure 12. Study Plan Page

- Description and Priority

A study plan is one of the most crucial parts of the system especially for students. It contains many courses in different semesters.

Cost: high, Risk: medium, Value: high.

- Use Case: Create Study Plan

A study plan can only be created by an administrator. The administrator fills out the name and the requirements of each created study plan.

- Use Case: Edit Study Plan

After a study plan has been created, the name and the requirements of the study plan can be changed by the administrator.

- Use Case: Add course

Courses can be added to the study plan. An administrator can add multiple courses at once to a specific semester. The courses that are added cannot be added again in one study plan.

- Use Case: Remove course

The courses that are added to the study plan can be removed from the study plan.

- Use Case: Assign study plan to academic year

A study plan can be assigned to an existing academic year. If an academic year already has a study plan assigned, that academic year can not be assigned another study plan.

- Use Case: Unassign study plan from academic year

A study plan can be unassigned from an academic year that already has a study plan assigned.

- Use Case: Assign to students

A study plan can be assigned to multiple specific students at once. The students that are assigned a custom study plan will not have the same study plan as other students within the same academic year.

- Use Case: Delete Study Plan

A study plan can be deleted by an administrator.

3.7. Feature: Student's Features

Figure 13. Student's Page

- Description and Priority

These are every feature of students. It details everything a student can do according to their access level and what they can see. It will also show the student's progress and the graduation requirements,

Cost: high, Risk: medium, Value: high

- Use Case: View Dashboard

Students will see this page first once they have logged in, this page includes the amount of courses taken by each type, failed courses, CGPA, and amount of credits of the students.

- Use Case: View Assigned Study Plan

Students are able see the study plan that is assigned to them by the administrator in another page.

- Use Case: Input grades

Students can input grades for each course in their authorized semester. The authorization of the semesters is according to their year level. If the student is a Freshman they can only input grades up to semester 2. If the student is a Sophomore they can only input grades up to semester 4. If the student is a Junior, they can only input grades up to semester 6. If the student is a Senior, they can only input grades up to semester 8.

- Use Case: Save Grades

Once they are done inputting grades, they can save the grades and the system will update the amount of courses taken by each type, failed courses, CGPA, and amount of credits of the students. CGPA is calculated using the same way as mentioned in the literature review.

Software Design and Architecture

1. **Logical View**

The architecture and design of this system is complex, a single diagram is not enough to show the entire system. Therefore, the software design and architecture are presented in various views. The Course Audit System is described in four different views:

1. Logical View: This view will show the main components of the system. It includes High-Level Design, Mid-Level Design, and Detailed Class Design.

2. Process View: the threads of control and processes used to execute the operations identified in the logical view.

3. Physical View: showcases components on how they're physically deployed in the system.

4. Use Case View: highlights all the possible use cases of a system, making it easier to understand the system.

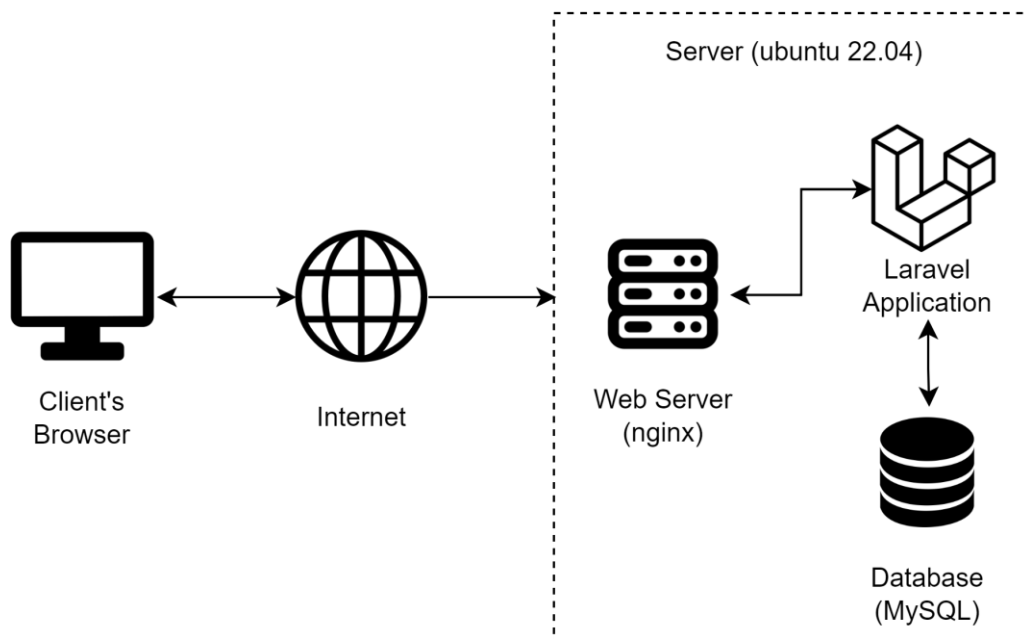## 1.1. High-Level Design

Figure 14. High-Level Design

Figure 14 is the high-level design of the system. It consists of:

● Client: The user's device used to access the web application through a browser.

● Internet: Needed to connect the client and the server

● Server: The server is running on Ubuntu 22.04 and it is responsible for handling the frontend, which is what the user will see and the backend, which

is all the processes related to the database. Nginx is installed on the server as a

web server and Laravel is also installed on the server.

● Database: MySQL database is used for the system data.

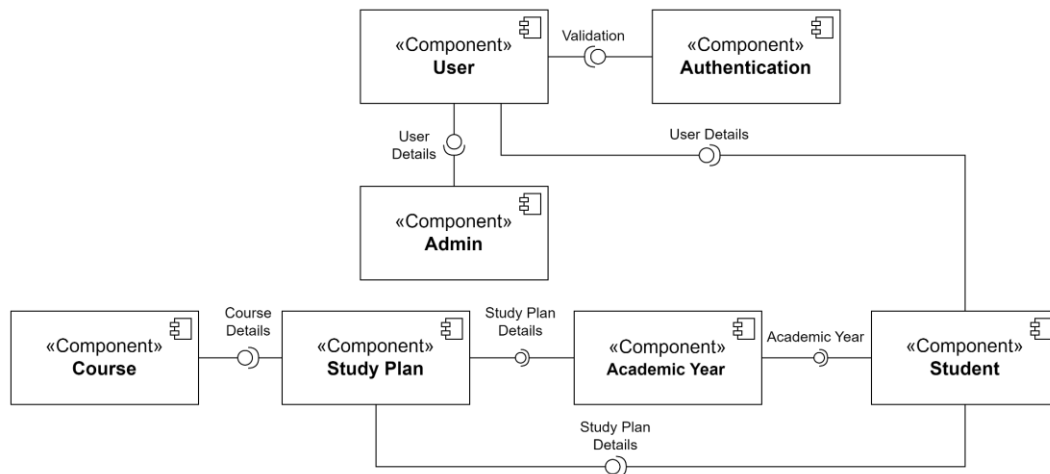**1.2.   Mid-Level Design**

Figure 15. Mid-Level Design

Figure 15 is the mid-level design, which is the components diagram. It shows

how each component is related to each other. As we can see, the authentication

validates the user and the user can be admin or student. Student component is

connected to the academic year component and the academic year component

provides the Study Plan. The student can also be connected to the study plan

component directly without an academic year and the study plan provides the course

details. The Course component provides its own details to the study plan component.
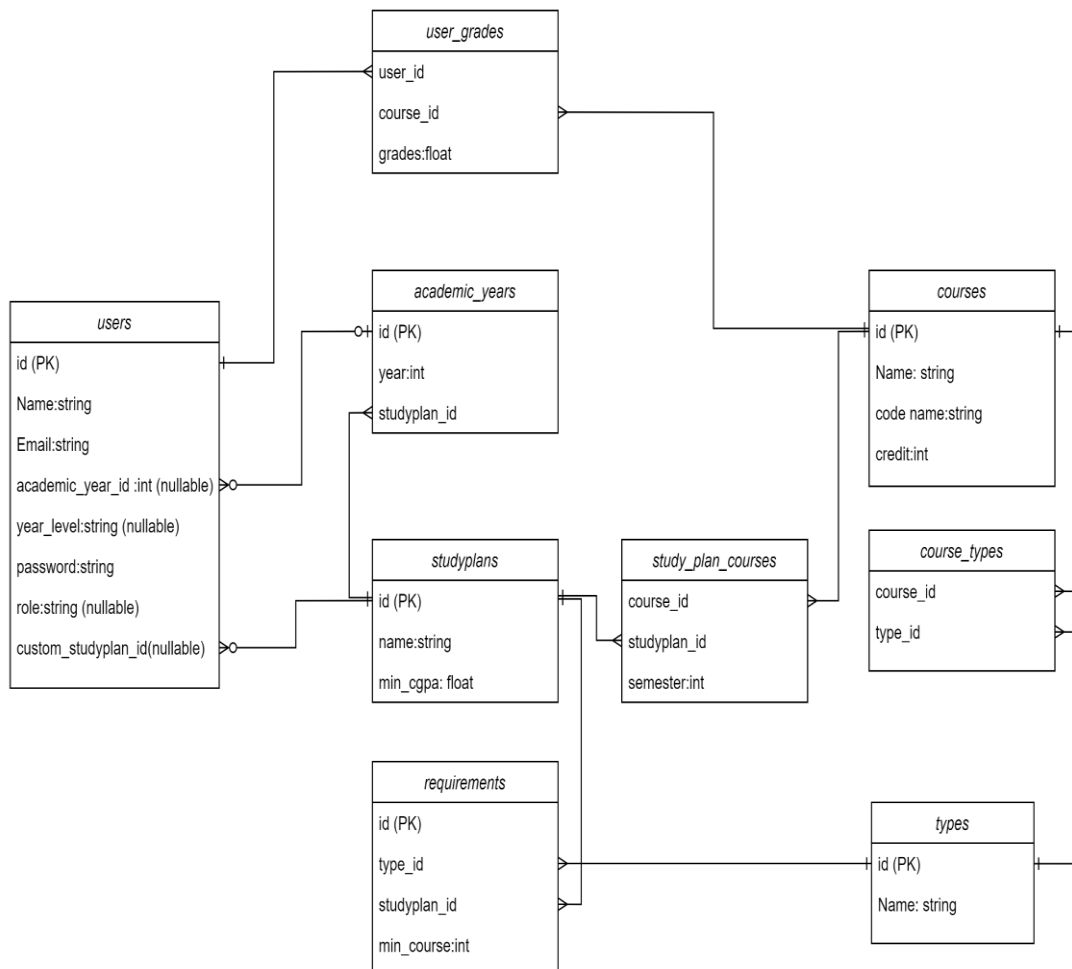
1.3. Detailed Class Design

Figure 16. Entity Relationship Diagram

Figure 16 shows the important class entities in the system. The Entity

Relationship Diagram shows how each entity is connected to one another. It also

shows the attributes of each entity and how some of them are related to the other

entity. It shows the database schema.

2. Process View

Multiple diagrams are used to represent the main features of the system.

2.1. Admin Create and Manage Student Account

Figure 17. Admin Create and Manage Student Account

Figure 17 shows the process of the admin creating and managing the student accounts. It starts with the students page and the admin can create, edit, and delete students. The process shows when the user creates a user the system will store the student data, when the admin edit student the system has to retrieve the student data first before storing new data. Deleting the student will make the system remove the student and their data.
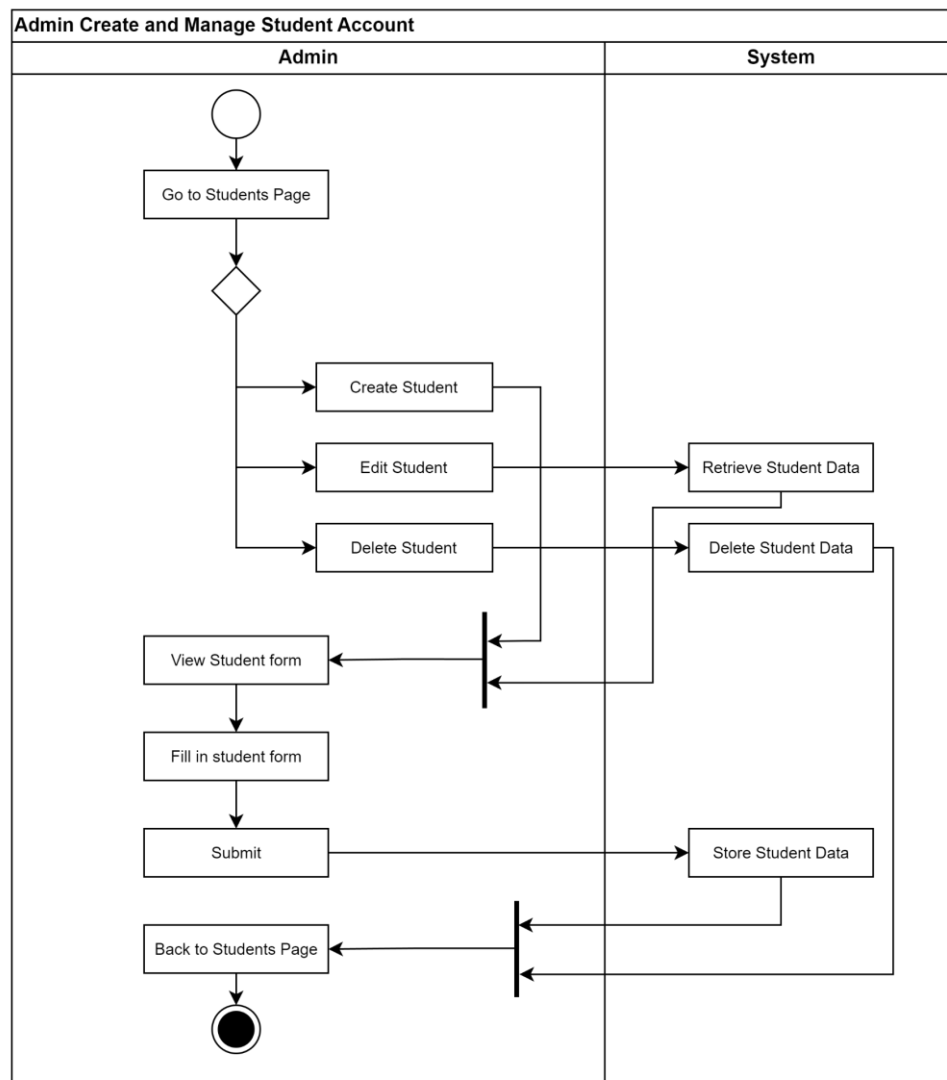
2.2. Admin Create and Manage Course
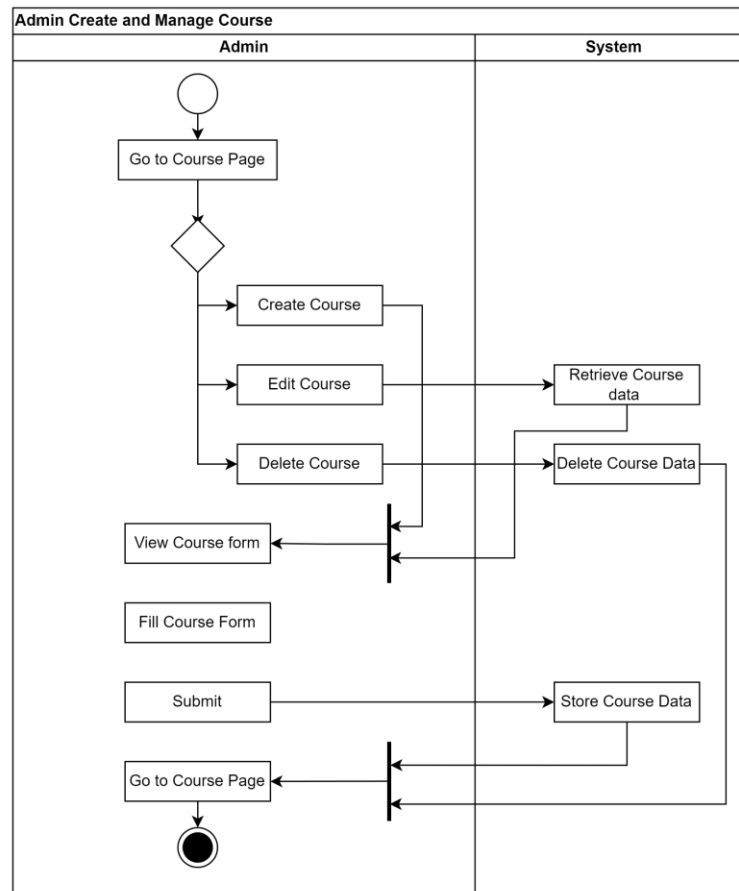
Figure 18. Admin Create and Manage Course

Figure 18 shows the process of the admin creating and managing courses. It starts with the course page and the admin can create, edit, and delete courses. The process shows when the user creates a course the system will store the course data, when the admin edit course the system has to retrieve the course data first before storing new data. Deleting the course will make the system remove the course and its data.

2.3. Admin Create and Manage Study Plan

Figure 19. Admin Create and Manage Study Plan

Figure 19 shows the process of the admin creating and managing study plans. It starts with the study plans page and the admin can create, edit, and delete study plans. The process shows when the admin creates a study plan the system will store the study plan data, when the admin edit study plan the system has to retrieve the study plan data first before storing new data. Deleting the study plan will make the system remove the course and its data.
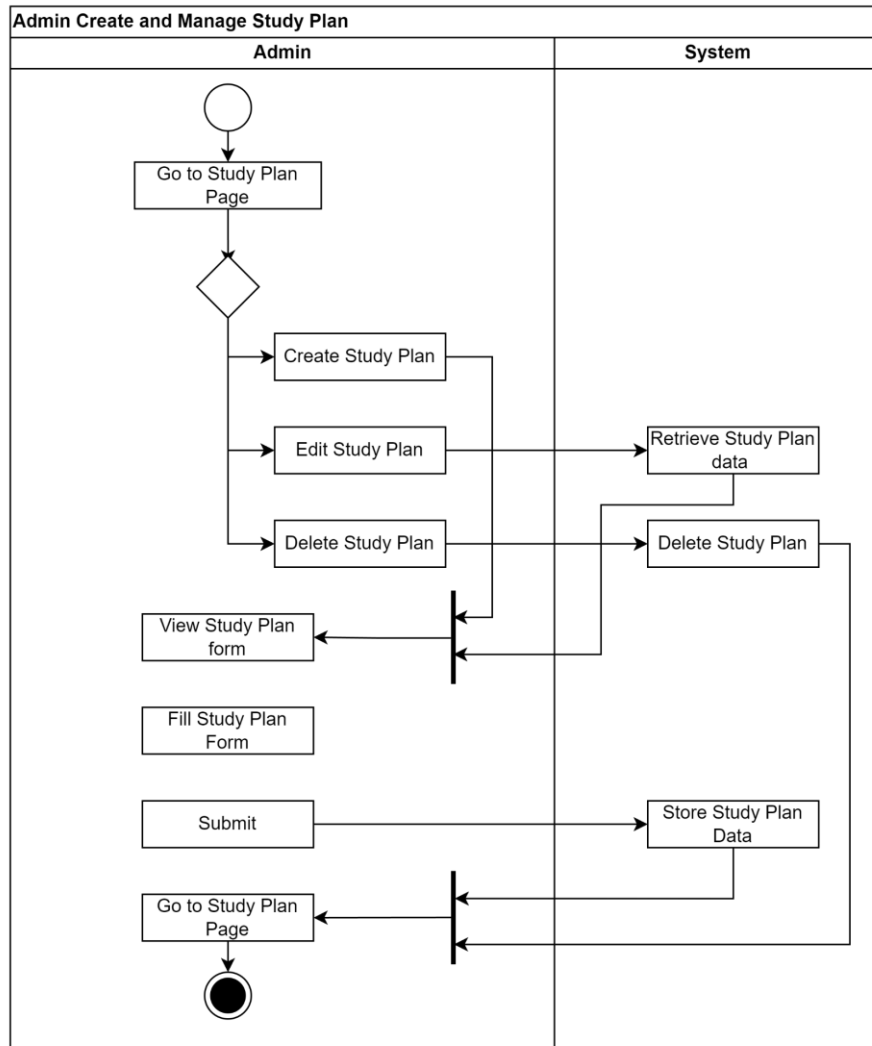
2.4. Admin Add and Remove Course From Study Plan
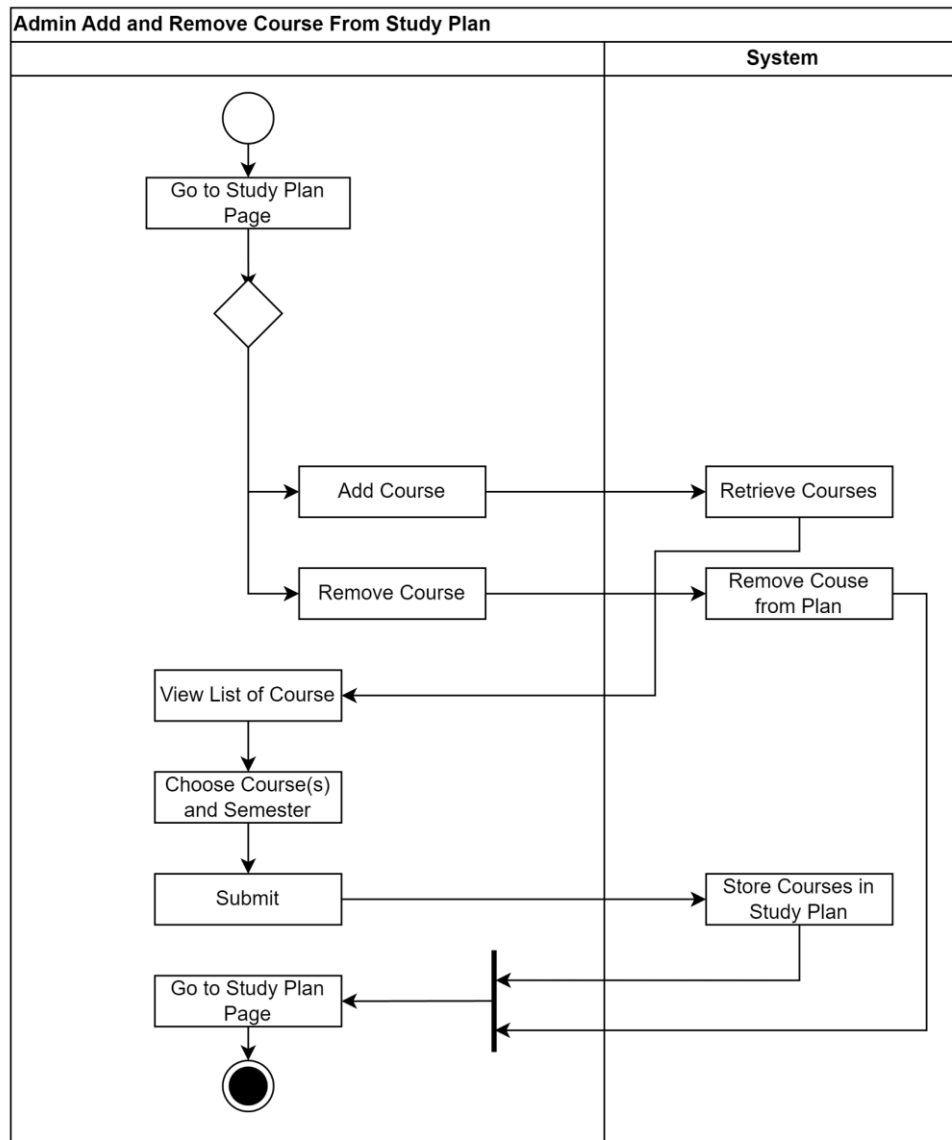
Figure 20. Admin Add and Remove Course From Study Plan

Figure 20 shows the process of admin adding and removing courses from the study plan. When the admin adds a course, the system has to retrieve the courses to show the admin. Then the admin selects the courses and adds them to a specific semester. The system will store the courses in the study plan as intended. The admin can also remove the courses from the study plan, once it is removed by the admin the system will also remove the courses from the study plan.

2.5. Admin Assign Study Plan
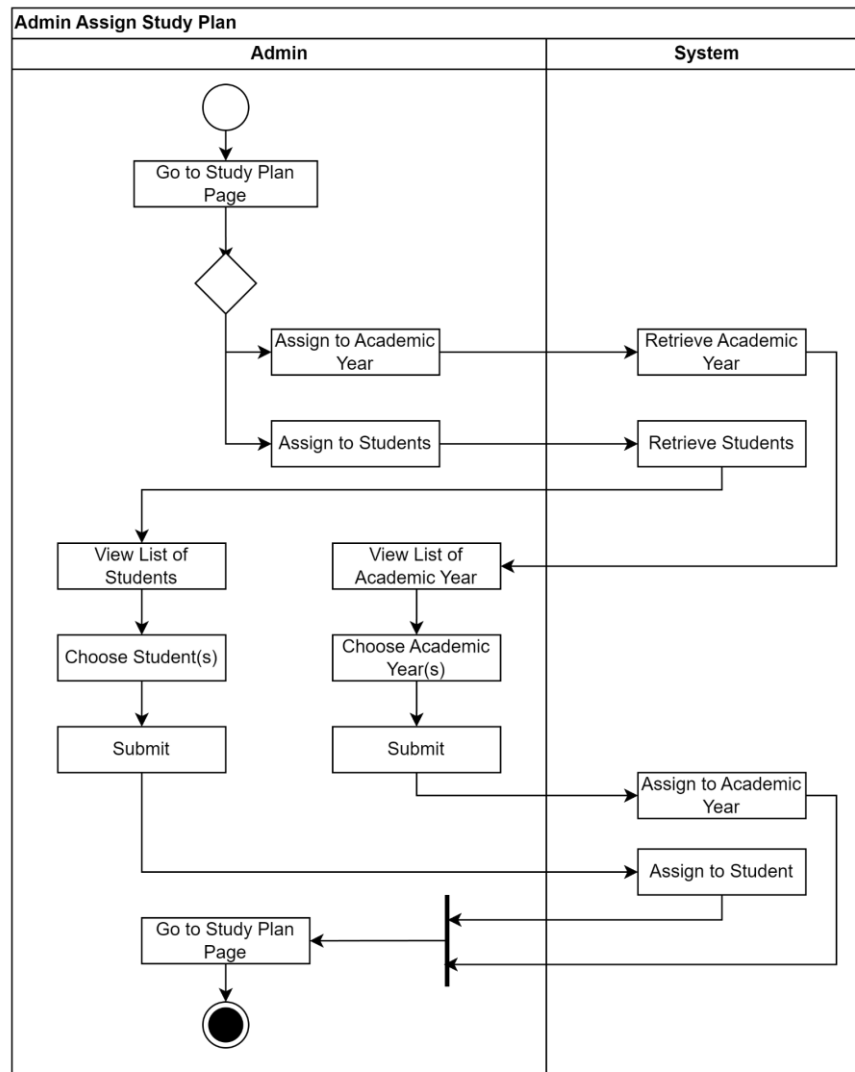
Figure 21. Admin Assign Study Plan

Figure 21 shows the process of Admin assigning study plans. The admin has the option to assign it to students or to an academic year. If the admin decides to assign to students, a list of students will be retrieved for the admin to choose. If the admin decides to assign it to an academic year, a list of years will be displayed for the admin to choose. Once the admin decided, the system will assign the study plan as intended.

2.6. Student View Study Plan and Update Grades
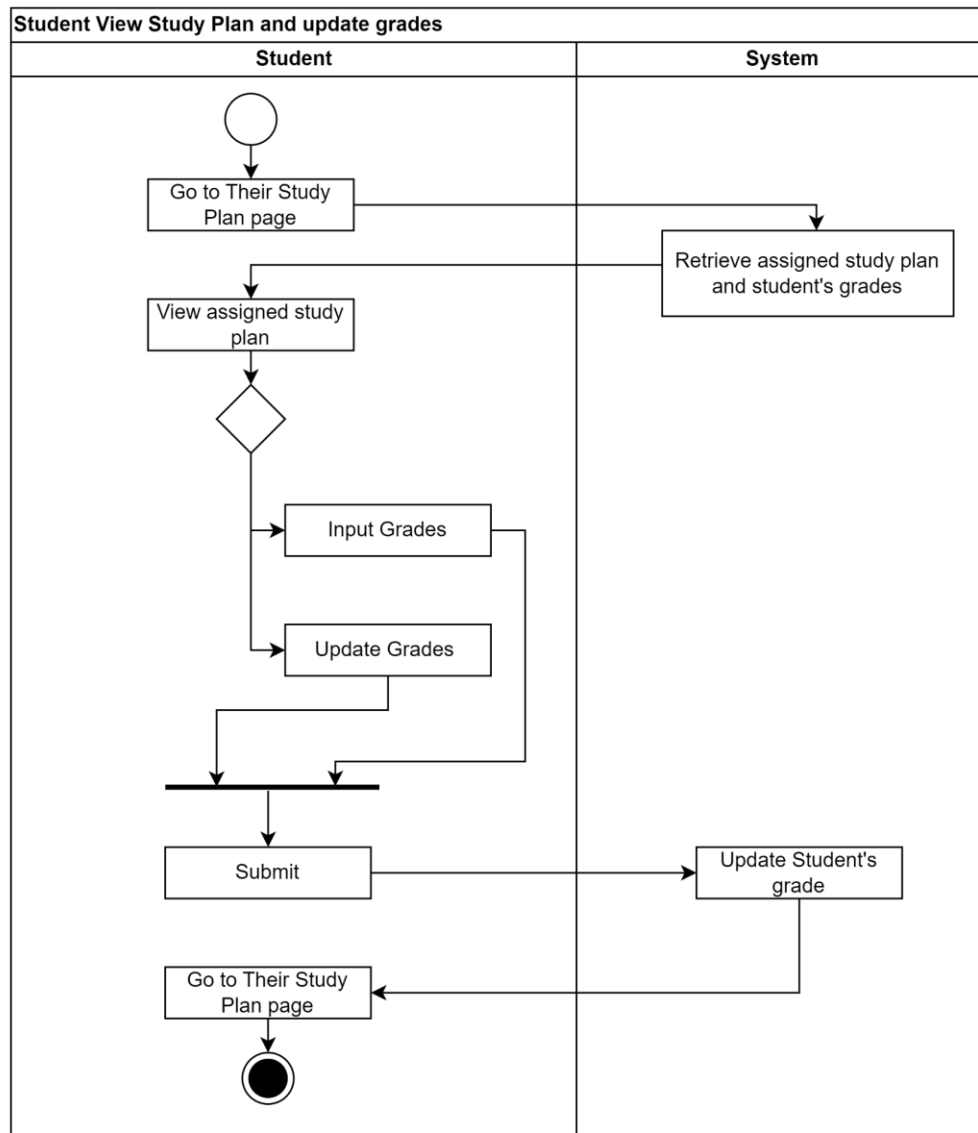
Figure 22. Student View Study Plan and Update Grades

Figure 22 shows the process of a student. A student can view and update their own grades. Their study plan will be retrieved by the system for them to view and they can input grades or update grades. Then they can save their grades and the system will update it.

3. **Physical View**
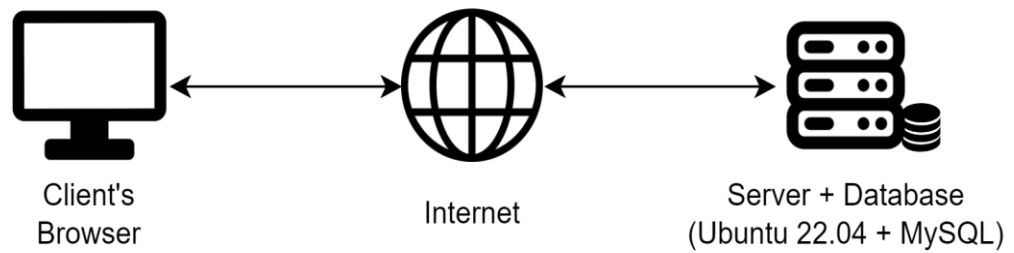
Figure 23. Physical View

Figure 23 shows how data is physically processed and saved throughout the system.

- The client's side access the system through a browser

- An internet connection is needed to connect the client to the server

- The server is using Ubuntu 22.04 and the database is using MySQL to handle everything. From the User interface to the processes of the system. MySQL database is used for storage.

4.   Use Case View

Figure 24. Use Case Diagram of Administrator

Figure 24 shows the use case of the administrator. The administrators are able to login, manage and view the users, courses, study plans, promote students and academic year.

Figure 25. Use Case Diagram of Student

Figure 25 shows the use case of a student. The students are able to login, view their assigned study plan, input grades and calculate the results.

Software Project Management Plan (SPMP)

   1.   **Startup Plan**

      1.1.   **Team Organization**

Project Manager: The project manager bears the responsibility of formulating

                             the project plan, overseeing risk management, and

                             delivering regular reports to the advisor.

Programmer (1):   Programmers are primarily responsible for coding and

                             testing modules. Since there is only one programmer, the
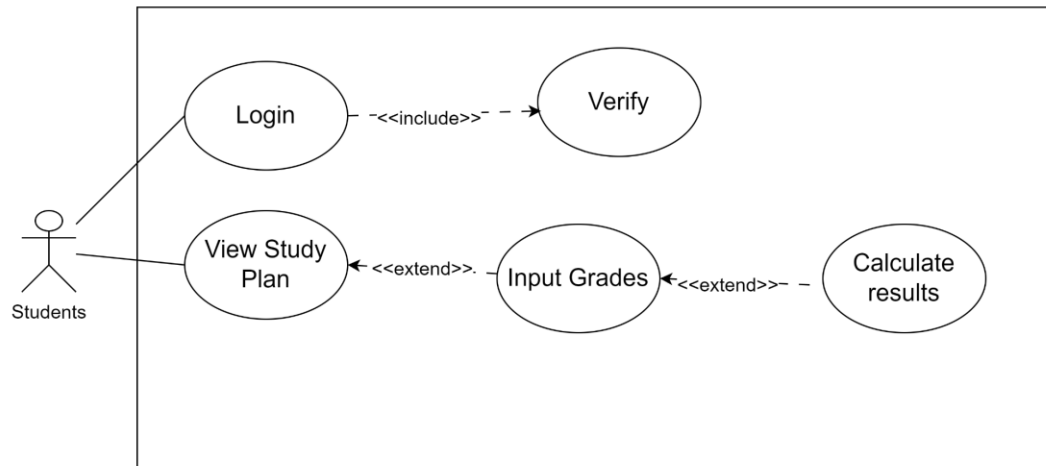
                             tasks of back-end and front-end are done by the sole

                             programmer. The tasks include designing and setting

                             up the database and making sure it works on the user

                             interface.

Advisor: The advisor helps guide and helps oversee every part of the

                             study.

      1.2.   **Project Communications**

     Various communication tools are employed for the purpose of project
communication. Face to face meetings, Telegram and Discord serve as platforms for
productive discussions between the researcher and the CS department, as well as
between the researcher and the advisor. These platforms are efficient and possess an
organized structure, enabling effective communication pertaining to the project.

      1.3.   **Technical Process**

     Application Lifecycle Management(ALM) is used to develop the system.
ALM is a comprehensive methodology that oversees the entire lifecycle of an
application, from its initial conception to its final deployment, encompassing various
phases such as requirements gathering, design, development, testing, and deployment.

1.4. Tools

The development tools used for building the system:

- The programming language used is PHP

- The framework for this project are Laravel and Bootstrap

- The code is written in Visual Studio Code

- The system is hosted in Akamai

2. Work Plan

2.1. Activities and Tasks

Table below shows the Work Breakdown Structure.

Task Name	Task Description	Effort	Start	End
Gather Requirements		21 days	March 20, 2023	April 9, 2023
Setup Project	Setup the local environments, setup database to start building.	7 days	April 10, 2023	April 17, 2023
Authentication		7 days	April 17, 2023	April 23, 2023
Create Account		1 day	April 17, 2023	April 17, 2023
Edit Account		2 days	April 18, 2023	April 20, 2023
Login		1 day	April 20, 2023	April 20, 2023
Configure Role and Authorization		2 days	April 20, 2023	April 22, 2023
Users Module		7 days	April 22, 2023	April 29, 2023
Users creation form		1 days	April 22, 2023	April 23, 2023
Users edit form		2 days	April 23, 2023	April 25, 2023
User delete		1 day	April 25, 2023	April 26, 2023

List of Users		2 days	April 26, 2023	April 28, 2023
User details page		1 days	April 28, 2023	April 29, 2023
Courses Module		7 days	April 29, 2023	May 6, 2023
Course types configuration		2 days	April 29, 2023	May 1, 2023
Course creation form		2 days	May 1, 2023	May 3, 2023
Course edit form		2 days	May 4, 2023	May 5. 2023
Course deletion		1 day	May 5, 2023	May 6, 2023
Academic Year Module		3 days	May 6, 2023	May 9, 2023
Year Creation		1 day	May 6, 2023	May 7, 2023
Make it increment		2 days	May 7, 2023	May 9, 2023
Study Plan Module		17 days	May 9, 2023	May 26, 2023
Study Plan creation		1 day	May 9, 2023	May 10, 2023
Requirements configuration	Setting requirements for each study plan	4 days	May 10, 2023	May 14, 2023
Edit Study Plan requirements		2 days	May 14, 2023	May 16, 2023
Semester configuration		2 day	May 16, 2023	May 18, 2023
Add/Remove Courses	Add or remove courses from study plan	5 days	May 18, 2023	May 23, 2023
Assign plan to academic year		3 days	May 23, 2023	May 26, 2023
Assign plan to students	For students with irregular study	4 days	May 26, 2023	May 30, 2023

	plan			
Student side module		10 days	May 30, 2023	June 9, 2023
Show assigned study plan		2 days	May 30, 2023	June 1, 2023
Grade Input		1 day	June 1, 2023	June 2, 2023
Student grades	Student's credits and CGPA calculation	4 days	June 2, 2023	June 6, 2023
Failed Courses	Show Failed courses to student	3 days	June 6, 2023	June 9, 2023
Testing and Deployment		7 days	June 9, 2023	June 16, 2023
Bugs fixes and changes	Log and changes to study plan	9 days	June 16, 2023	June 25, 2023

Table 14. Work breakdown Structure.

2.2. Release Plan

The system will be released once the system is finished on June 16, 2023. The development of all the main features are completed, the system will be deployed. Any unexpected bugs will be resolved if they appear.

2.3. Iteration Plans

The system iteration plan provide the objectives, activities, and effort of each iteration:

- Iteration 1:
  - Objective: Setup project
  - Activities:
    - Set up local environment
    - Set up database
    - Create tables in database
  - Effort: 7 days

- Iteration 2:
  - Objective: Authentication
  - Activities:
    - Implement Authentication
    - Implement roles and authorization
  - Effort: 7 days
- Iteration 3:
  - Objective: Users Module
  - Activities:
    - Implement CRUD operations for students
  - Effort: 7 days
- Iteration 4:
  - Objective: Course Module
  - Activities:
    - Implement CRUD operations for courses
    - Implement course types
  - Effort: 7 days

- Iteration 5:
  - Objective: Academic Year Module
  - Activities:
    - Implement create academic year and make it incremental
  - Effort: Three days
- Iteration 6:
  - Objective: Study Plan Module

- ○ Activities:

  - ■ Implement CRUD operations for study plan

  - ■ Implement requirements for plans

  - ■ Implement Add/Remove courses in study plan

- ○ Effort: Seventeen days

- ● Iteration 7:

  - ○ Objective: Student Side Module

  - ○ Activities:

    - ■ Implement student view

    - ■ Implement grades and credits calculation

    - ■ Implement show failed courses

  - ○ Effort: 10 days

2.4.   Budget

No money was spent to build this project because the researcher still has free

credits on akamai to host.

3.   Control Plan

3.1.   Monitoring and Control

The monitoring and control track the activities of the project as follow:

20/3/2023   –   Starting the project

10/4/2023   –   Starting the development of the system.

9/6/2023   –   Testing the project: the system is tested as a whole to

                            make sure it's working properly

14/6/2023   –   Deployment: monitor and make sure for any

                            unexpected issue

3.2. Project Measurements

Table below shows the project management

Phase	Measurement	Source
Planning	Project Timeline	Project Schedule
	Design completeness	Document
Deployment	Quality of the Code	Outcomes
Testing	Correctness	Outcomes
Deployment	System availability	Server

Table 15. Project Measurements

4. Supporting Process Plans

4.1. Risk Management Plan

A big risk in this project is getting the wrong requirements, therefore it is important to avoid it so that the project can go on smoothly. These are some actions taken to avoid the risk:

- The requirements are carefully discussed with the advisor and the CS department and documented before the building process.
- The design of the system is carefully reviewed before continuing to the development phase.

If the risk becomes a problem, the requirements gathering period will be extended and the design and requirements gathering have to be done simultaneously.

4.2. Configuration Management Plan

The configuration management plan is as follows:

1. The source code will be uploaded to a GitHub repository.

2. All the documentation of this project will be uploaded to a folder in Google Drive.

3. All the changes in documentation will be recorded by Google Docs.

4.3. Verification and Validation

Actions taken to assure the quality of the development process and resulting software products:

- Verification:
  - Reviewing requirements to make sure that it is complete.
  - Review the design of the system to ensure that it is ready for the development phase.
  - Review the code to ensure that there are no errors.
  - Testing the system to make sure that all the features are working as intended.
- Validation:
  - Letting the users test the system to make sure that it is easy to use
  - Conduct User Acceptance Testing to ensure that the system meets the expectation

4.4. Product Acceptance Plan

- Acceptance Criteria:

- ○ The system should be compatible with browsers, such as Google Chrome, Microsoft Edge, and other browsers. The recommended browser to use the system would be Google Chrome.

- ○ The system should meet all the functional requirements.

- Acceptance testing:

  - ○ User Acceptance Test: Let users test the system to see if it meets the acceptance criteria.

CHAPTER IV

Summary of Findings

1. **Functional and Non-Functional Requirements of the system.**

   Based on the discussion with the computer science department and the

responses from students, the functional and non-functional requirements were formed.

   Functional requirements:

- CGPA calculation: Calculate the amount of CGPA students that they have and

  show the minimum requirements

- Count courses taken by type: Calculate the amount of courses taken by each

  type and show the required amount

- Credit calculation: Calculate the amount of credits of students and show the

  amount of required credit

- Failed Courses: Identify and show the courses students failed.

- Manage Students: Admin is allowed to create, edit, and delete a student's

  account.

- Manage Courses: Admin is allowed to create, edit, and delete a course.

- Manage Study-Plan: Admin is allowed to create, set requirements for each

  course type, add and remove courses from study plan, and delete a study plan

- Assign Study Plan: Admin is allowed to assign a study plan to an academic

  year, and to specific students

- Logging: Admin is able to see which student has updated their grades at which

  time.

- Student's Dashboard: Student immediately sees the failed courses if there's

  any and show the amount of courses completed by type

- Student Update Grades: Students can input grades for each course and save the grades. Once it is saved their data will be updated.

  Non-Functional requirements:

- Usability: The system should be intuitive and user-friendly. It should be easy to navigate

- Operation: Internet connection is essential to use the system. It runs up anytime anywhere.

- Performance: All features of the system should be quick with no delay.

- Security: Secure authentication, access control, and passwords are encrypted.

- Accessibility: Able to access on web browser, and even a responsive design on mobile device

The system that was built based on these requirements was met with positive feedback from the students after they tested it.

2. **Data students need to be conscious of their expected time of graduation**

Based on the responses from students the data collected indicates that students need to know the following:

- CGPA: students are interested in knowing the required CGPA for graduation eligibility.

- General Course Requirement: student wants to know the minimum requirements for each type of course. Students want to know this to help them meet the necessary course requirements for graduation.

- Credit: Students consider credit requirements to be crucial information for their timely graduation. They want to be aware of the number of credits needed to fulfill the requirements of their program.

- Retake: students want to know the courses that they need to retake. By knowing what courses to retake, it can help them avoid any obstacles that might delay their graduation.

With the system showing these data, students find the system to be useful for them to check on their academic progress.

Conclusions

Based on the findings, the following conclusions were formed:

1. The system must implement the following requirements:

    a. Functional requirements: CGPA calculation, count courses taken by type, credit calculation, failed courses, manage students, manage courses, manage study plan, assign study plan, logging, student's dashboard, student update grades.

    b. Non-functional requirements. The system should also be intuitive and user friendly. Internet connection is essential to use the system. The system features must work quickly with no delay. Authentication and authorization must be implemented and passwords are encrypted.

2. The important information that students need to know to be conscious of their expected time of graduation are CGPA, General Course Requirements, Credit, and Retake.

Recommendations

With the findings and conclusions of this study, there are few recommendations for future studies. The recommendations are:

1. Recommendations on the requirements:

- The system is currently a standalone system without any connection or integration to other systems. In the future, the authentication of the users can be the same as of the domain of my.paragoniu.edu.kh account. With the authentication being the same as the school's system it would be more convenient for the user.

- As mentioned above that the system is a standalone system, the grades are manually input by students. In future studies, the system can be integrated or use an API from the grading system to check the actual student's grades.

- The system can be integrated or use the API of the school's system or be imported from the school's course plan and course name in the future.

2. The data used to answer this question was from CS junior and sophomore. In future studies, a larger population of study would be more insightful and see if other departments think differently.

Other Recommendations:

- In this study, the user acceptance testing was conducted in a quantitative method. A qualitative method would also be a great way to gain a deeper understanding of the user's experience.

- If the system were to be expanded to the university, automatic scaling in memory and CPU are needed. One way to do it is using Horizontal Scaling.

REFERENCES

[1]   R. A. Hassan, S. Kahar, H. S. A. Nawi, and R. Sardi, "Graduation audit reporting system: Gaining a competitive advantage," Faculty of Communication, Visual Art and Computing, Universiti Selangor, Malaysia, 2016

[2]   Computer Science Department

[3]   A. Wick and V. Wallingford. (2016). "Degree Audit Reporting System (DARS): What Works and What is Needed," Bemidji State University, 2016

[4]   J. E. Mendez-Mateos, G. Gupta, A. I. Karshmer, and J. P. Brown, "NADA: NMSU Advising & Degree Audit System," Department of Computer Science, New Mexico State University, Las Cruces, NM 88011. [Online]. Available: https://www.researchgate.net/profile/Gopal-Gupta-5/publication/2806123_NADA_NMSU_Advising_Degree_Audit_System/links/5436f9ec0cf2643ab9888dd1/NADA-NMSU-Advising-Degree-Audit-System.pdf.

[5]   E. Tittel and K. Brush. (2022, Apr.25) *What is Application Lifecycle Management (ALM)?* [Online]. Available: https://www.techtarget.com/searchsoftwarequality/definition/application-lifecycle-management-ALM

[6]   D. Marikyan and S. Papagiannidis (2021) *Theoryhub: Unified Theory of acceptance and use of Technology* [Online]. Available:

https://open.ncl.ac.uk/theories/2/unified-theory-of-acceptance-and-use-of-technology/#:~:text=The%20Unified%20Theory%20of%20Acceptance,social%20influence%20and%20facilitating%20conditions.

[7]   Paragon International University, *Undergraduate Student Handbook*. 2020.

[8]   University of Colorado Springs, *What is Degree Audit?*

[9]   Claflin University (n.d.). *Early Alert Program* [Online]. Available: https://www.claflin.edu/academics-research/academic-resources-support/academic-success-center/early-alert-program

[10]   U. Liza.(2022, Oct.31). *Applied research: Definition, types & examples* [Online].
         Available: https://www.questionpro.com/blog/applied-research/

[11]   T. George.(2022, Dec.02) *Mixed methods research: Definition, guide & examples* [Online]. Available: https://www.scribbr.com/methodology/mixed-methods-research/

[12]   Jotform. (n.d.). *Likert Scale* [Online]. Available: https://www.jotform.com/likert-scale-creator/#:~:text=Likert%20scale%20questionnaire%20ratings%20are,%2C%20(5)%20strongly%20agree.

APPENDIX A

Curriculum Vitae

Chi Phong Kang

Phnom Penh, Cambodia

phongkang123@gmail.com

Education

2019 - 2023 | Bachelor of Computer Science, Paragon International University

2014 - 2019 | The Westline School

Skills

Web Development | PHP Laravel, Bootstrap, and MySQL.

Personal Information

Date of Birth: June 8, 2002

Age: 21

Gender: Male

Nationality: Khmer

APPENDIX B

Letter to the Dean of ICT Faculty

January 20, 2023

Paragon International University

Subject: Approval Letter for Conducting Study

Dear Dr. Meirambek,

My name is Chi Phong Kang, currently a senior student in the ICT faculty of ParagonIU & majoring in Computer Science. As it is required for my final year project, I will be conducting research looking into the Course Audit System.

In my study, I will be interviewing the head of the department of computer science and CS sophomore and junior year students. Before I interview them, I would like to humbly ask for your permission.

The research will be conducted in an ethical manner for academic purposes and will be kept confidential, under the supervision of Mr. Neil Ian Uy in collaboration with ParagonIU.

I would be very grateful for you to grant us this approval to conduct the research.

Regards,
Chi Phong Kang

APPENDIX C

Letter to the Head of the Computer Science Department

January 20, 2023

Paragon International University

Subject: Approval Letter for Conducting Study

Dear Mr. Neil,

My name is Chi Phong Kang, currently a senior student in the ICT faculty of ParagonIU & majoring in Computer Science. As it is required for my final year project, I will be conducting research looking into the Course Audit System.

In my study, I will need to interview you multiple times. Before I do, I would like to humbly ask for your permission.

The research will be conducted in an ethical manner for academic purposes and will be kept confidential, under the supervision of Mr. Neil Ian Uy in collaboration with ParagonIU.

I am looking forward to hearing from you.

Regards,
Chi Phong Kang

APPENDIX D

USER ACCEPTANCE QUESTIONNAIRE

Participant data

1. Age:
2. Year level:
   - Sophomore
   - Junior
   - Senior

Acceptance Testing
On a scale of 1 for strongly disagree to 4 for strongly agree. How would you rate the following:

ID	ITEMS	RESULT
Q1	I can input my grade to each course quickly	1 2 3 4 ☐☐☐☐
Q2	I can save my grades quickly	1 2 3 4 ☐☐☐☐
Q3	I find the system easy to use	1 2 3 4 ☐☐☐☐
Q4	Learning to use the system was easy for me.	1 2 3 4 ☐☐☐☐
Q5	I would recommend the system for others.	1 2 3 4 ☐☐☐☐
Q6	I think the system would be helpful for others	1 2 3 4 ☐☐☐☐
Q7	I can use the system on my browser without any problems	1 2 3 4 ☐☐☐☐
Q8	The system is running smoothly	1 2 3 4 ☐☐☐☐
Q9	Using the system enables me to accomplish the audit quickly	1 2 3 4 ☐☐☐☐

Q10	I would find the system useful to help me check my academic progress.	1 2 3 4
Q11	I want to use the system	1 2 3 4

APPENDIX E

USER JOURNEY

Admin Side

Login	
E-Mail Address	
Password	
	☐ Remember Me
	Login

User   Course   Academic Year   Study Plan   Log   Logout

Students

Add New Students

Promote Students

🔍 search...   Search

#	Name	Year Level	Year	email	Actions
1	TEST-CS	Senior	2019	test@test.com	View Edit Delete
2	Tester2	Senior	2019	test2@test.com	View Edit Delete

User   Course   Academic Year   Study Plan   Log   Logout

Create New Student

Name

Email

Password

Year Level ⌄   Academic Year ⌄

Save

Promote Students

| Q search... | Search |

select	Name	Year Level	Year	email
☐	a	Sophomore	2020	a@test.com

Save

View TEST-CS

Semester 1

Code	Course Name	Credit	Type(s)	Grades
CS 125	Principles of Programming I	3	F-Core	DD
ECON 100	Introductory Economics	3	F-SocSci	DC
ENGL 101	Academic English I	4	F-Eng	CC
KHM 101	Khmer Studies I	3	F-KHStudies	BB

User   Course   Academic Year   Study Plan   Log   Logout

Edit Student

Name

TEST-CS

Email

test@test.com

Password

Senior

| Senior ▾ | 2019 ▾ |

Update

User Course Academic Year Study Plan Log Logout

Courses

Add New Course

🔍 search...   Search

#	Name	Code Name	Credit	Types	Actions
1	Principles of Programming I	CS 125	3	F-Core	Edit Delete
2	Introductory Economics	ECON 100	3	F-SocSci	Edit Delete

Name

Code Name

Credit

☐ DE

☐ Core

☐ GE

☐ F-Core

☐ F-Eng

☐ F-SocSci

☐ F-MathSciTech

☐ F-KHStudies

☐ Math

Save

Academic Years

Add New Year

Year	Study Plan
2019	CS-SP Batch I
2020	MIS-SP

Study Plan

Add New Study Plan

🔍 search... Search

#	Name	Actions
1	CS-SP Batch I	Assign Edit Unassign Edit Plan Assign to Student Delete

Assign to Academic year

☐ 2021

Save

Unassign from Academic year

☐ 2019

Save

Add/Remove course to the Study Plan

Add Course

Semester 1

Code	Course Name	Credit	Type(s)	Action
CS 125	Principles of Programming I	3	F-Core	Remove
ECON 100	Introductory Economics	3	F-SocSci	Remove

Courses

🔍 search...   Search

Add to Semester [Semester ⌄]

Select	Name	Code Name	Credit	Types
☐	Web Design & Development	CS 260	3	DE
☐	Management Information Systems	MIS 201	3	DE
☐	Advanced Concepts in Web Development	CS 226	3	DE

Assign to Students

🔍 search...   Search

☐ TEST-CS

☐ Tester2

☐ TEST-MIS

☐ a

Save

Logs

LogName	Description	Updated At
ChangeGrade	TEST-CS changed their grades	Monday, 03-Jul-2023 06:18:14 UTC
ChangeGrade	demo changed their grades	Tuesday, 27-Jun-2023 07:28:13 UTC

Student Side

Login	
E-Mail Address	
Password	
	☐ Remember Me
	Login

Dashboard   Study Plan   Logout

Welcome TEST-CS

Note: Core, Math, F-MathSciTech, and F-Core courses will be marked as incomplete and needs to be retaken to complete if the grade is DD or F.

Incomplete courses:

Code	Course Name	Type(s)
CS 125	Principles of Programming I	F-Core
224	Object Oriented Programming	Core
MIS 380	Human-Computer Interaction	DE

	Minimum Requirements	Completed
Department Elective (DE)	18	13
Core	12	9
General Elective (GE)	4	2
F-Core	2	1
F-Eng	2	3
F-SocSci	2	2
F-MathSciTech	2	2
F-KHStudies	2	1
Math	4	4
Credits:	**132**	**107**
CGPA	**2.0**	**2.34**

Welcome TEST-CS

Semester 1

Code	Course Name	Credit	Type(s)	Grades
CS 125	Principles of Programming I	3	F-Core	DD
ECON 100	Introductory Economics	3	F-SocSci	DC
ENGL 101	Academic English I	4	F-Eng	CC
KHM 101	Khmer Studies I	3	F-KHStudies	BB
MATH 130	Pre-Calculus	4	F-MathSciTech	BA
MIS 112	IT Applications for Business Purposes	3	F-MathSciTech	Grade

Semester 2

Code	Course Name	Credit	Type(s)	Grades
CS 126	Principles of Programming II	3	F-Core	CB
ECON 201	Microeconomics	3	F-SocSci	BA
ENGL 102	Academic English II	4	F-Eng	CC

Save

	Minimum Requirements	Completed
Department Elective (DE)	18	13
Core	12	9
General Elective (GE)	4	2
F-Core	2	1
F-Eng	2	3
F-SocSci	2	2
F-MathSciTech	2	2
F-KHStudies	2	1
Math	4	4
Credits:	**132**	**107**
CGPA	**2.0**	**2.34**

Note: Core, Math, F-MathSciTech, and F-Core courses will be marked as incomplete and needs to be retaken to complete if the grade is DD or F.

Incomplete courses:

Code	Course Name	Type(s)
CS 125	Principles of Programming I	F-Core
224	Object Oriented Programming	Core
MIS 380	Human-Computer Interaction	DE

APPENDIX F

PARAGON
INTERNATIONAL UNIVERSITY
C A M B O D I A

ENDORSEMENT LETTER

In partial fulfilment for the requirements for the degree Bachelor of Science in Computer Science.   This thesis entitled **"COURSE AUDIT SYSTEM: A GRADUATION REQUIREMENT VALIDATOR FOR PARAGONIU STUDENTS"** has been examined and recommended for Pre-Oral Defense.

RATANA SOTH
ADVISER

APPENDIX G

PARAGON
INTERNATIONAL UNIVERSITY
C A M B O D I A

ENDORSEMENT LETTER

In partial fulfilment for the requirements for the degree Bachelor of Science in Computer Science. This thesis entitled **"COURSE AUDIT SYSTEM: A GRADUATION REQUIREMENT VALIDATOR FOR PARAGONIU STUDENTS"** has been examined and recommended for Pre-Oral Defense.

Ichkong Kang
ENGLISH CRITIC

Website: www.paragoniu.edu.kh
Tel: +(855) 23 996 111
+(855) 15 996 111
+(855) 17 996 111
Email: info@paragoniu.edu.kh
Address: No: 8, St: 315, Boeung Kok 1, Toul Kork, Phnom Penh

Leading Your Way...