# Tappy : A Web Based Arduino - Driven Attendance Monitoring and Management System for STI College Carmona

**A Capstone Design Project**
**Presented to the Faculty of the**
**Information Technology Program**
**STI College Carmona**

**In Partial Fulfilment**
**of the Requirements for the Degree**
**Bachelor of Science in Information Technology**

**Angelito Kurt Denzel M. Bustria**
**Aniceto J. Macuto Jr.**
**Shane H. Rivera**
**John Eliezer B. Vidal**

**May 16, 2025**

**Table of Contents**

# Chapter I

# INTRODUCTION

## 1.1 Project Context

An RFID-based attendance system represents a substantial advancement over traditional manual sign-in or card swipe methods, which are often subject to numerous inefficiencies, human error, and potential for manipulation. Conventional attendance systems typically depend on individuals physically signing in or swiping their identification cards, a process that can result in inaccuracies, mistakes, and, in some instances, deliberate tampering. In contrast, an RFID (Radio Frequency Identification) system automates the entire process by utilizing radio waves to securely and swiftly identify individuals without the need for direct contact or manual intervention. The primary aim of this project is to design and implement a robust RFID attendance system that not only streamlines the attendance-taking procedure but also minimizes the risk of fraud and unauthorized access. By employing RFID technology, the system intends to enhance overall reliability, ensuring the accurate tracking and recording of attendance data in real time, while simultaneously reducing the administrative workload. Furthermore, the inherent automation of the RFID system contributes to improved operational efficiency, positioning it as a highly reliable and secure alternative to traditional methods. Through the development and implementation of this system, the goal is to provide an innovative solution that enhances the accuracy, security, and efficiency of attendance management across various settings, including educational institutions, workplaces, and other organizations.

## 1.2 Purpose and Description of the Project

This project aims to build and set up an RFID-based system to track and record attendance at schools or universities. It seeks to boost productivity, accuracy, and safety by replacing manual and error-prone methods of tracking attendance with an RFID solution. SMS Notification for Guardians and Class Attendance Monitoring for Teachers will be optimized for usage.

The system has two main parts: hardware (RFID scanners and tags) and software (a database and a user interface). The database keeps attendance records safe, and administrators can check, watch, and manage these records through an easy-to-use interface. This tech aims to speed up the process by cutting down on human errors, reducing the chance of fake sign-ins, and giving places dependable, live attendance data. One of the features of Tappy is sending SMS notifications to the guardians of the students once the student is inside the campus. On the other hand, class attendance is also monitored by the professor once the student taps the Scanner from the guard house.

## 1.3 Objectives of the Study

### 1.3.1 General Problems

How to create a system to improve efficiency and save time compared to the traditional manual attendance method on campus? How would an automated scanner help students and teachers validate and monitor attendance more effectively?

### 1.3.2 Specific Problems

- How will the system maintain the number of students that are currently enrolled in the campus and also the faculty members?
- How will the system provide up to date by creating real-time updates to avoid problems like spamming the SMS of the guardian?
- How will the system integrate the validation of the students entering the campus?
- How will the system handle duplicate student or faculty records?
- How will the system differentiate between full-time and part-time faculty members?

### 1.3.3 General Objective

To develop and implement an RFID based attendance system to address the inefficiencies and limitations of existing manual and also automated attendance monitoring methods by integrating RFID technology.

### 1.3.4 Specific Objective

- By developing a system that will record all students and faculty members to integrate the system smoothly.
- By inventing real-time updates that can be utilized by limiting sending notifications to the guardians to prevent spamming.
- By enhancing a system that will validate the students' information in the guardhouse.
- By creating unique student/faculty member code for differentiation.
- By having a list of faculty members and indicating who are full time and part timers.

### 1.3.5 Significance of the Study

This study will be useful and can give contribution to some parties, as follows:

**Students.** The RFID-Based Attendance System encourages students to take personal responsibility for their attendance. Each student is assigned with a RFID tag, making it clear who is present and who is not. This level of accountability can prevent the students from skipping classes or engaging in proxy attendance, where one student marks another student as present who is absent. As students recognize that their attendance is being monitored closely, they are more likely to attend classes regularly, fostering better academic habits.

**Teachers.** One of the primary advantages of the RFID-Based Attendance System for the teachers is the time saved during attendance taking. Instead of spending minutes on roll calls, where the teacher calls the students one by one. With the rfid-based attendance system students can simply tap their RFID tags as they enter the classroom. This quick process allows teachers to begin lessons promptly, maximizing instructional time and minimizing disruptions.

**School.** One of the advantages of this system for the school is the automated scanning process at the school entrance, which represents an innovative approach not yet implemented in educational institutions. Additionally, the attendance tracking within the classroom for faculty members is highly convenient and efficient.

**Proponents.** This study will be useful for the proponents because in the RFID-Based Attendance System, it provides a reliable and efficient way to track the students' attendance. by automating the process, it will be easy for the researchers to gather the data, and it offers researchers to develop more effective strategies when it comes to education.

**Future Proponents.** The study RFID-Based Attendance System can help future proponents by providing a fast and accurate way of tracking the student's attendance and for further innovations when it comes to attendance tracking and can be a guide for developing more effective attendance strategies.

## 1.4 Scope and the Limitations of the Study

### 1.4.1 Scope

Tappy evaluates the RFID-based attendance system's effectiveness in improving accuracy and reducing manual errors compared to traditional methods. It examines user experience for both attendees and administrators, as well as the design and deployment of the system's hardware and software. Additionally, the study analyzes the system's impact on time management, allowing educators to maximize instructional time. The goal is to enhance classroom efficiency and dynamics.

**ADMINISTRATOR:**

1. **Admin Login Page Module** - The Login Page Module for Administrator facilitates secure system access through authentication via username and password. It ensures that only authorized users can log in, providing features such as password recovery and user management to maintain control and security.

- **ID Username** - Use to Access the Login page Module of Super Admin
- **ID Password** - Verifies Super Admin for Accessing the Module

**Admin Dashboard -** The Admin Dashboard offers a comprehensive overview, including the total number of students, pending requests, active courses, upcoming events, priority tasks, announcements, and access to the academic calendar.

- **Total Students -** Shows the total of Active Students in Campus

- **Active Courses -** Shows the Curriculum of students in different programs
- **Upcoming Events -** Shows Banner type of Upcoming Announcements

**Student Record -** The Student Record displays students enrolled in various programs, along with their student IDs, year levels, and statuses.

**Course Management -** The Course Management provides Students Subjects including their prerequisites.

- **Subjects/Courses of Students** - Shows the different courses of the students per program.

**Student Registration -** The Student Registration section provides an application form for students to complete with their personal information.

**Student Profile -** The Student Profile provides personal information of the student.

**PROFESSORS & STUDENTS:**

1. **Professor & Students Login Page Module -** This Login Page Module provides secure access for professors & students to the system, requiring authentication through a username and password. It ensures only authorized users can log in, granting access to relevant teaching.
- **Username -** Use to Access the Login page Module
- **Password -** Verifies for Accessing the Module

2. **Homepage Module -** The Homepage Module serves as the central interface of the system, providing users with quick access to key features and information. It is designed

for ease of navigation, offering a user-friendly layout that enhances the overall user experience while ensuring efficient interaction with the system's primary functions.

3. **Student Profile -** This shows the details of the student to know their Course, Year & Levels, Subjects, etc.

- **Course -** Shows the Students Course
- **Year & levels -** Shows the Students Year & Level
- **Subjects -** What Subject the students are taking

4. **Class Attendance Module -** The Class Attendance Module allows for efficient tracking and management of student attendance. It enables instructors to record, monitor, and analyze attendance data, ensuring accurate and real-time reporting.

- **Date & Time -** Current Day Date & Time for Attendance

5. **Calendar Module -** The Calendar shows the history and the current events in the school for updates.
6. **Logout Module -** The Logout Module securely terminates a user's session.

### 1.4.2 Limitations

The following are the Limitations of the system:

- **No Monitoring of Departure:** The system only records the time when a student or faculty taps in, since there will be no tap out, it won't track if the students or faculty leave early. It only marks their presence. It can't provide a complete record of when a student or faculty actually leaves the classroom or school.
- **Dealing with Absences:** The system usually just tracks if students are present. If a student is absent, it doesn't automatically notify teachers, parents, or administrators for absences.
- **Limited to Identified Personnel:** RFID systems only work with registered or issued RFID tags. Visitors or temporary staff without tags cannot be monitored, requiring alternative methods to track their attendance.

# CHAPTER II

## Review of Related Literature/Systems

### Foreign Related Literature

#### A New Model of The Student Attendance Monitoring System Using RFID Technology

Ula, et al. (2021), The advancement of information technology today has made tasks easier, faster, and more efficient. Many systems, like attendance checking, are still done manually using paper, which is time-consuming and often inaccurate. Sometimes, people simply sign their names as proof of attendance, but this method is unreliable. This study introduces a new attendance system that uses RFID technology. RFID uses sensors to read data from a card, making it easier for students and lecturers to check attendance. When a student scans their RFID card, their information is automatically sent to a database. This process is faster and more accurate, motivating both students and lecturers to arrive on time, as the system records and displays attendance instantly.

#### Attendance Monitoring Using Adjustable Power UHF RFID and Web-Based Real-Time Automated Information System

Ly, TN. (2021). The academic performance is significantly impacted by the attendance system. By showing the student's name in real-time in the event of card fraud. The suggested program enables the lecturer to directly assess the student's situation. For every subject, it automatically displays the student's weekly learning status. In order to give the teacher a

comprehensive picture, it also gives them the general percentage of pupils participating in the topics. The system helps by automatically visualizing the teacher's attendance data for each session and by notifying students via email of the number of lessons, increasing their awareness of the situation.

### The need of using a Radio Frequency Identification (RFID) System

According to Muhammad Ahmad Baballe (2021). Radio Frequency Identification is a technology used for identification purposes of persons or objects by transferring data through radio waves, often called the RFID tag. The RFID system consists of two basic parts: the RFID reader, which is also called the interrogator, and the tag or transponder. The reader sends signals to these tags, and it is in return that replies with their stored information, decoded and processed. The campus has effectively utilized RFID technology to simplify attendance tracking by assigning students unique identifiers stored in a database. The system eliminates the traditional method of the possibility of loss or damage of the traditional attendance records, and there is a more accurate and efficient way of handling attendance.

## Local Related Literature

### Modernizing Cite Students Attendance System with RFID Technology

Cadungog, et al. (2021). As technology continues to improve, schools are moving away from the old way of taking attendance with pen and paper. The project of College of Information Technology and Engineering, Notre Dame of Midsayap College goal is to overcome issues with manual attendance methods, such as mistakes, time-consuming processes, and difficulty

accessing records. By implementing RFID technology, it makes the attendance process quicker and more reliable. This new system could greatly change how schools manage attendance, making it more in line with today's digital advancements.

**Fraud Detection Using Isolation for RFID-BASED Attendance Monitoring System.**

Nalupa, et al. (2022). In this study, the authors emphasize the critical role of monitoring student attendance using Radio-Frequency Identification (RFID) technology within educational institutions. They highlight the vulnerability of current RFID-based systems to attendance fraud, where individuals can exploit the technology by marking attendance without being physically present. To address this challenge, the researchers designed an attendance monitoring system that incorporates the Isolation Forest algorithm, an unsupervised machine learning technique adept at identifying anomalies in attendance data. Their implementation achieved impressive performance metrics, including an accuracy of 95.69%, precision of 96.33%, and recall of 95.81%. This research underscores the potential of integrating advanced fraud detection mechanisms into existing RFID systems, aiming to enhance the reliability and integrity of attendance monitoring processes in educational settings.

**Radio Frequency identification (RFID) Based Technology In Taytay Senior High School: Attendance Management System Amidst Pandemic**

Agdong et al. (2022), RFID technology provides substantial benefits to educational institutions, notably in terms of improving attendance management and resource allocation processes. Their analysis of Taytay Senior High School's attendance management system demonstrates how the use of RFID provides a framework for improving safety and efficiency

during the epidemic. This is consistent with prior research by Want (2006), who found that RFID devices help improve tracking and management processes in educational settings, resulting in a safer environment for students and staff.

**Synthesis**

The integration of Radio Frequency Identification (RFID) technology in educational attendance systems has significantly enhanced efficiency, accuracy, and reliability. Traditional attendance methods, reliant on manual inputs like paper and pen, are prone to errors, time inefficiencies, and risks of data loss. Studies by Ula et al. (2021) and Cadungog et al. (2021) highlight that RFID technology addresses these issues by automating attendance tracking, thereby aligning with modern technological advancements. RFID systems allow students and lecturers to scan RFID cards, instantly recording attendance in a database, promoting punctuality and real-time monitoring.

Beyond basic tracking, RFID systems provide additional features that improve the learning environment. Ly (2021) demonstrates how RFID systems enhance transparency by identifying fraudulent activities, visualizing attendance data for teachers, and sending students personalized notifications to improve accountability. Similarly, Baballe (2021) underlines the precision and reliability of RFID in managing attendance, which eliminates manual record-keeping flaws.

However, vulnerabilities such as fraud persist. Nalupa et al. (2022) address this challenge by integrating machine learning algorithms, such as the Isolation Forest, into RFID systems. This approach significantly increases system integrity, detecting anomalies with high accuracy, precision, and recall. Moreover, Agdong et al. (2022) underscore RFID's role in adapting to new challenges, such as ensuring safety and efficiency during crises like pandemics, further affirming its utility in modern educational institutions.

Collectively, these studies affirm that RFID technology is a transformative tool for attendance management, blending efficiency, reliability, and adaptability, while ongoing enhancements address its limitations to ensure robust implementation.

# CHAPTER III

# TECHNICAL BACKGROUND

## 3.1 Overview of Current Technologies to be Used in the System

### 3.1.1 Methodology of the Study

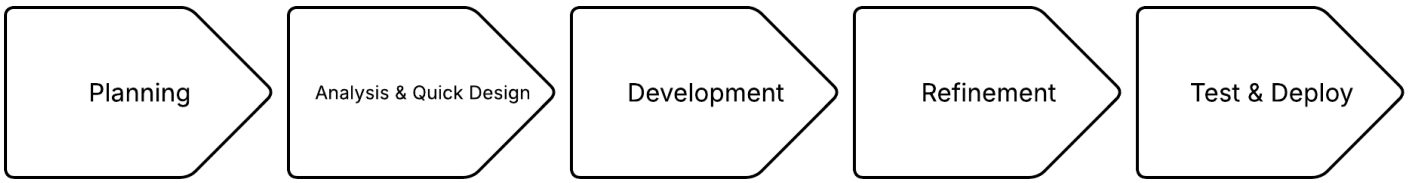



*Figure 1. Prototyping Methodology Diagram*

Prototyping is a development approach in which an initial system prototype is created and incrementally enhanced through continuous user feedback and iterative refinement. It is systematically improved and expanded until they evolve into the final, fully functional product. This method allows Tappy to enhance each prototype until the final prototyping is produced, this method consists of continuous testing and refinements in order to improve systems usability, effectiveness, and performance.

**Planning:** This is where researchers gather requirements for the project in mind. Planning aims to gather information to create a piece of work.

**Analysis & Quick Design:** This is the initial phase where developers, designers, and stakeholders analyze user needs and create a rough design of the system. The focus is on understanding the core functionality rather than building a complete system.

**Development (Building the Prototype):** The development phase involves creating the initial version of the system based on the quick design. This version is often a simplified model that demonstrates the system's basic functionalities.

**Refinement (Making Improvements):** Based on the feedback received, the prototype undergoes modifications to improve its functionality, performance, and usability.

**Test (Ensuring System Reliability & Stability):** The refined prototype is tested for functionality, performance, and security to ensure that the system works as expected.

**Deploy (Final Implementation & Release):** Once the prototype has been thoroughly refined and tested, it is finalized and deployed for real-world use. This phase may involve launching the system for a small group of users before full-scale release.

### 3.1.2 Theoretical Framework

#### 3.1.2.1 IT Theories

Several ideas and concepts in information technology (IT) contribute to the design and implementation of a successful RFID Attendance system. Here are some information technology-related ideas that have been applied to RFID Attendance system:

- **Arduino IDE**: A user-friendly integrated development environment used for programming the Arduino microcontrollers in **C++**, enabling precise control of RFID components such as tags, readers, and peripheral hardware.
- **MyPHP**: A relational database management system used to store and organize attendance data securely, providing efficient data retrieval and manipulation for reporting and analytics.
- **Visual Studio Code**: A lightweight, versatile text editor with robust extensions for coding in streamlining the development process for both hardware and software components of the RFID system.
- **XAMPP:** A free tool that lets a website run on a computer. It includes a web server (Apache), a database (MySQL), and PHP, which helps build and test websites before putting them online.
- **HTML:** A standard language used to create and structure content on the web. It uses tags to define elements like headings, paragraphs, links, images, and more, allowing browsers to display content in a readable and organized way.
- **CSS:** A language used to style and design the appearance of HTML elements on a web page. It controls layout, colors, fonts, spacing, and responsiveness, allowing developers to create visually appealing and consistent websites.
- **JAVASCRIPT:** A programming language used to add interactivity and dynamic behavior to

websites. It allows developers to create features like form validation, animations, interactive maps, and real-time updates, enhancing user experience on the web.

#### 1.1.2.2 Non-IT Theories

This study will employ the following non-IT theories:

- **IT LITERATE**

  The system necessitates personnel responsible for managing the entire web-based application, ensuring continuous monitoring of events that occur when a user interacts with the platform.

- **LOGBOOK**

  It keeps records of the users to be able for the user to browse it back whenever it is needed, and also to monitor the history of recent activities.

### 3.1.3 Hierarchy Chart

**Figure 1** illustrates the specific modules accessible on the admin side of the system. Upon logging in, the admin can modify the elements displayed on the landing page. Additionally, the admin can manage the inside of the system.

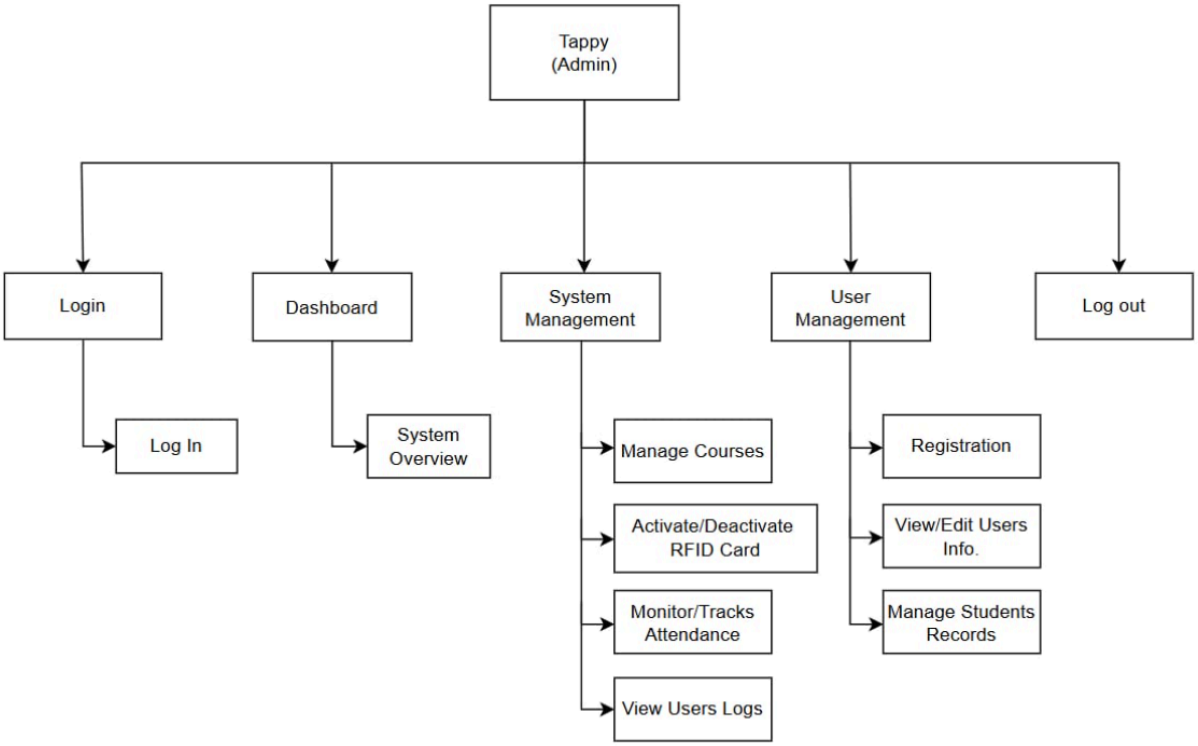



*Figure 1. Hierarchy Chart: Admin Module*

**Figure 2** Shows the modules accessible to Professors. Upon logging in, Professors can access the Class Attendance Module, where they can monitor students' year & level, subjects, and the date & time.

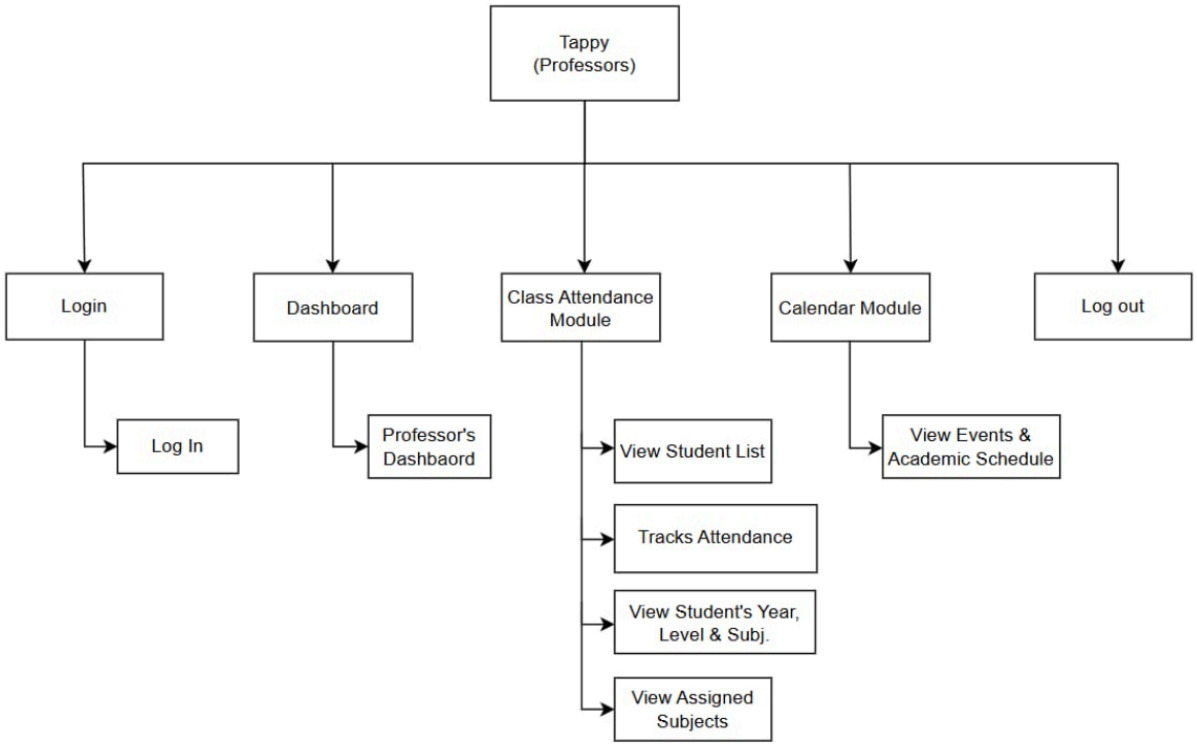



*Figure 2. Hierarchy Chart: Professor's Module*

**Figure 4** Shows the modules accessible to Students. Upon logging in, Students can access the Homepage Module, where they can track Announcements, Calendar History, etc.

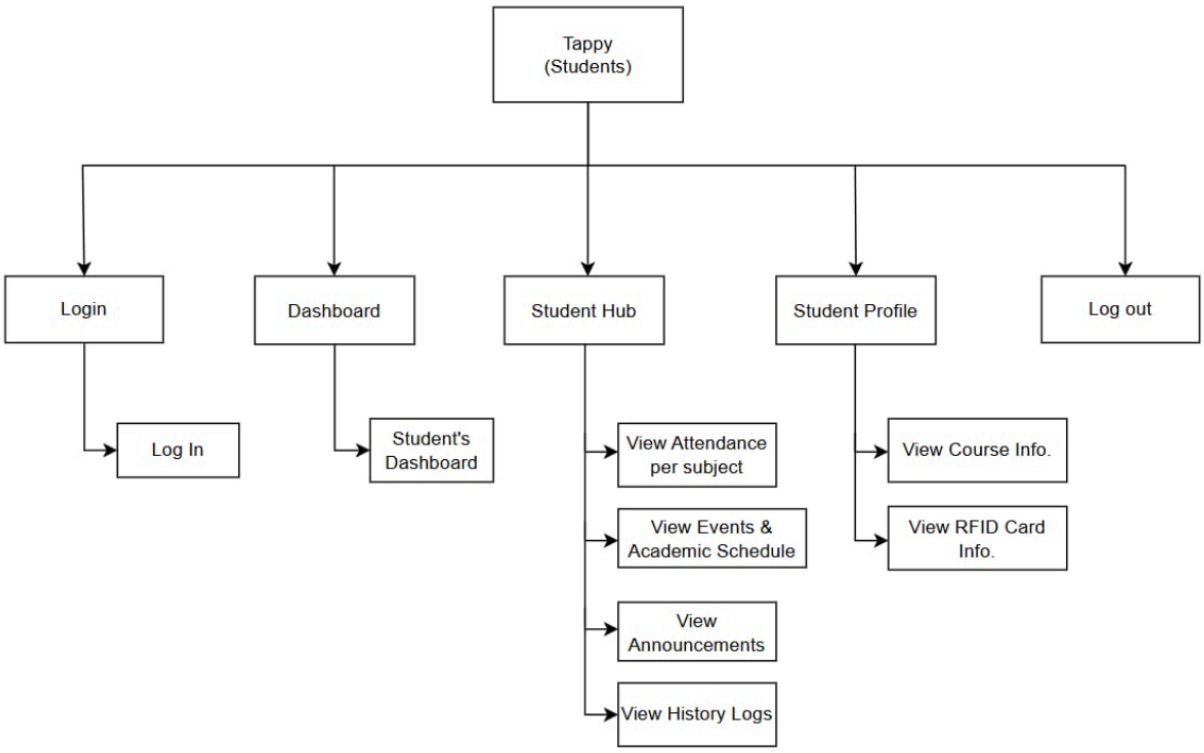



*Figure 4. Hierarchy Chart: Student's Module*

### 3.1.4 Data Flow Diagram

**LEVEL 0**

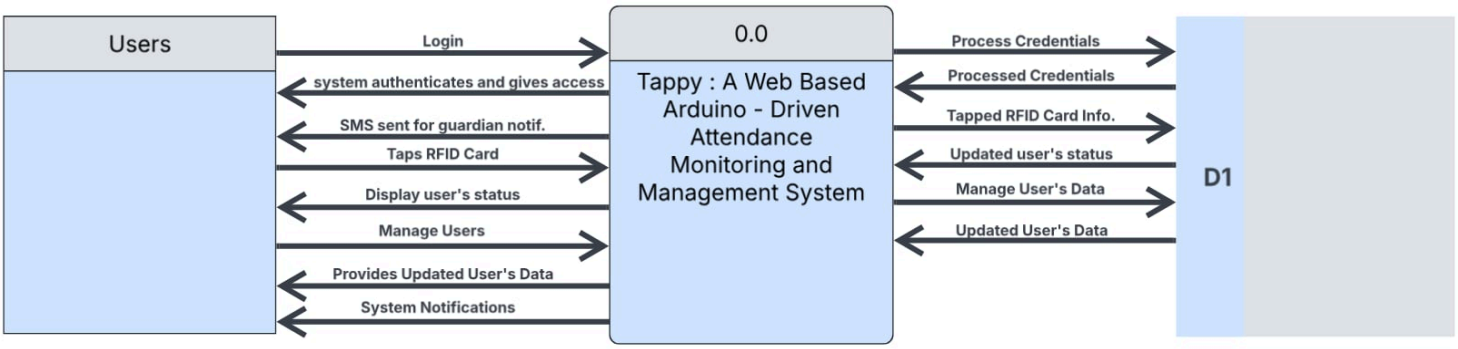



*Figure 5. Level 0 Data Flow Diagram*

## LEVEL 1 (ADMIN)

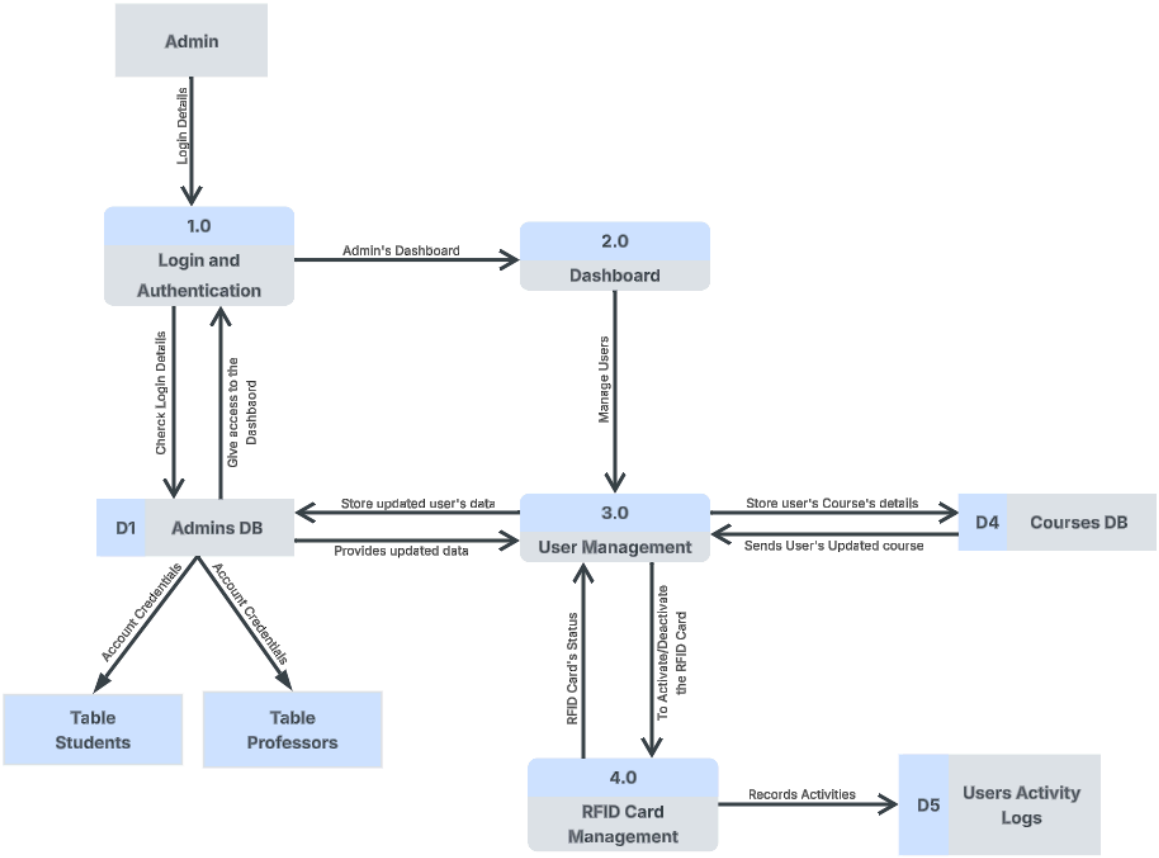



*Figure 6. Level 1 (Admin) Data Flow Diagram*

## LEVEL 1 (PROFESSOR)

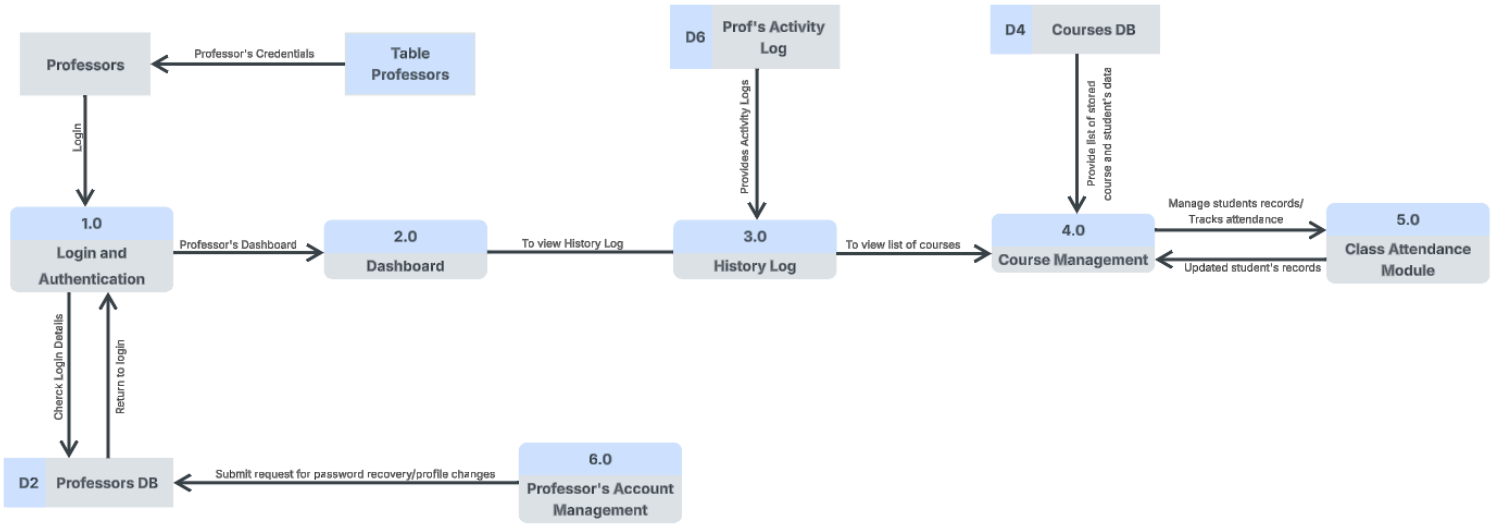



*Figure 8. Level 1 (Professor) Data Flow Diagram*

## LEVEL 1 (STUDENTS)

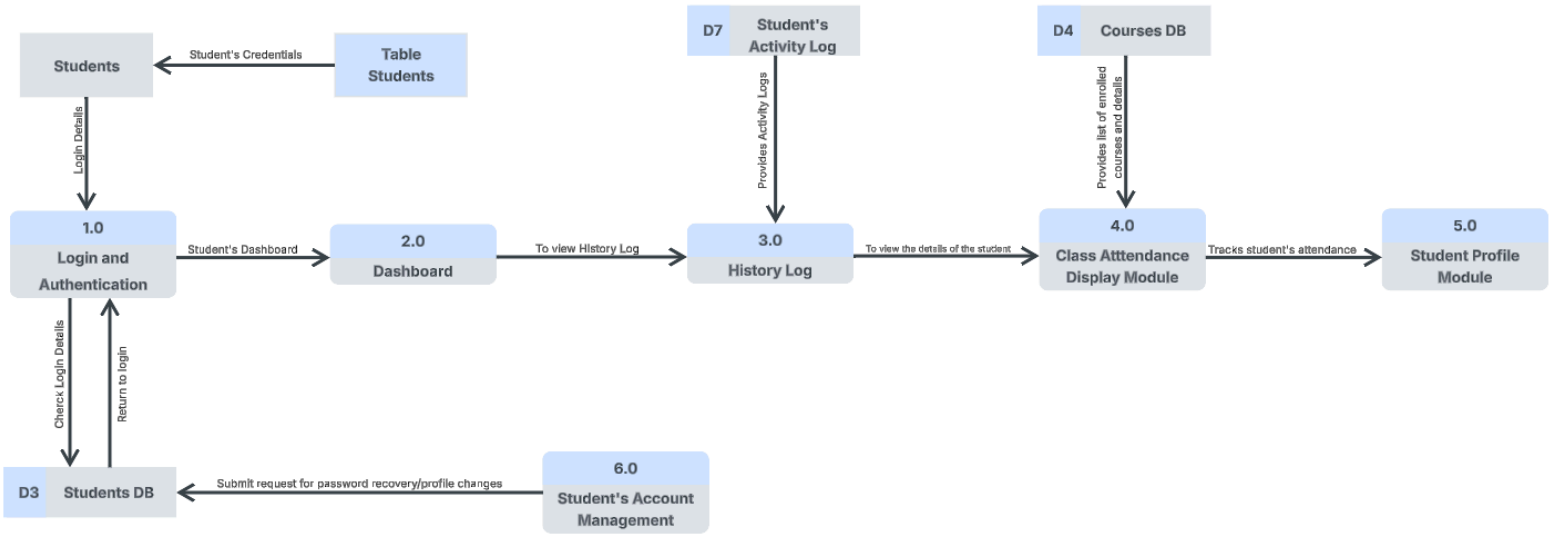



*Figure 9. Level 1 (Students) Data Flow Diagram*

### 3.1.5 Entity-Relationship Diagram

**Figure 10** The entity relationship diagram illustrates how entities are related using their relationships.

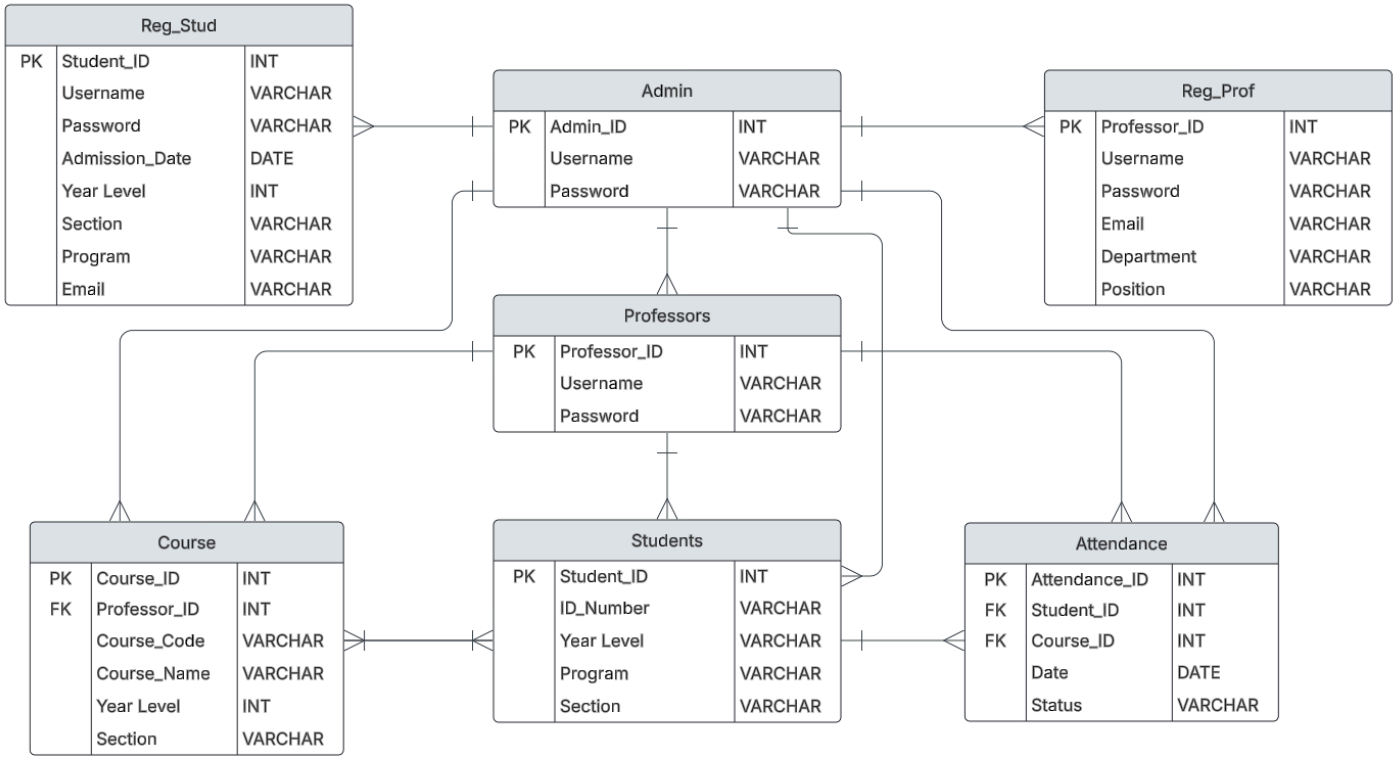
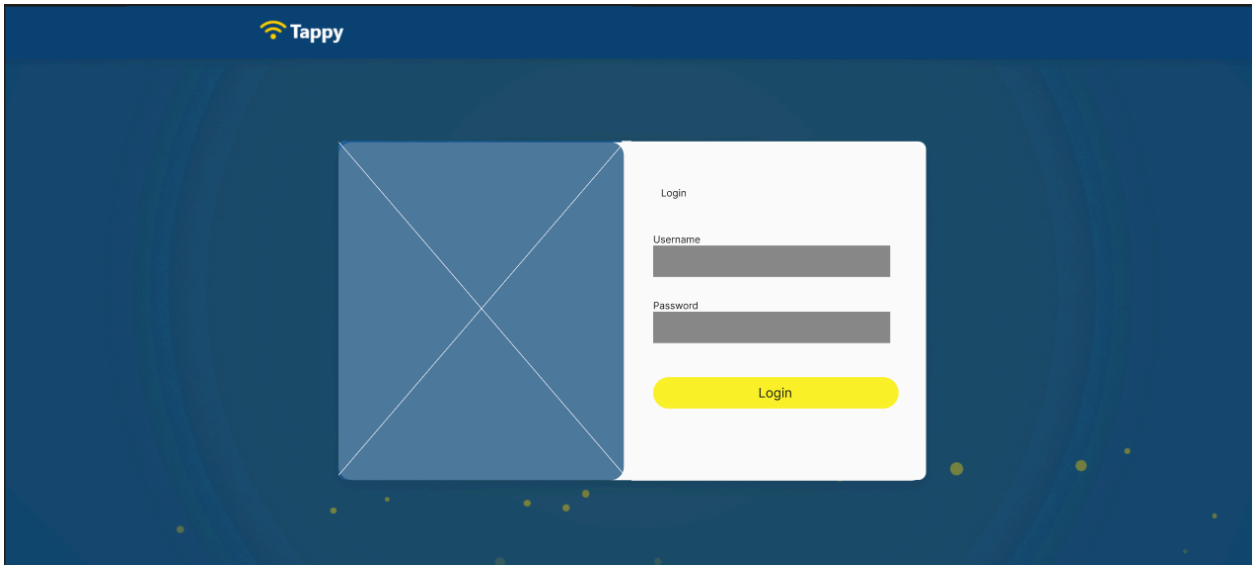
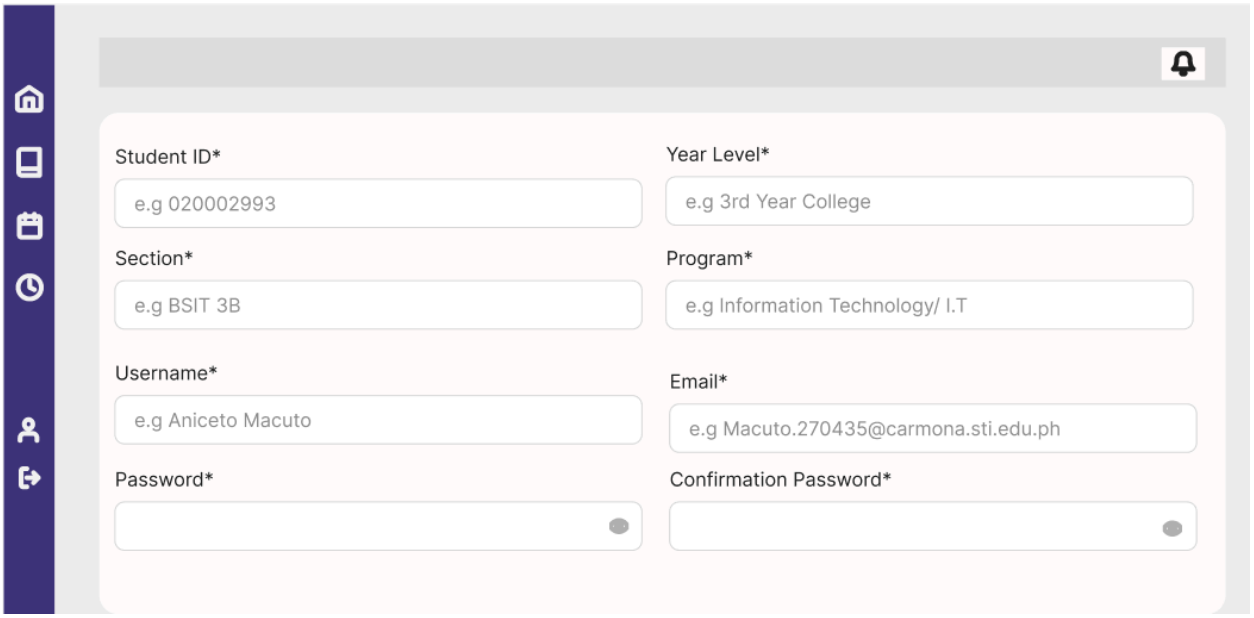



*Figure 10. Entity-Relationship Diagram*

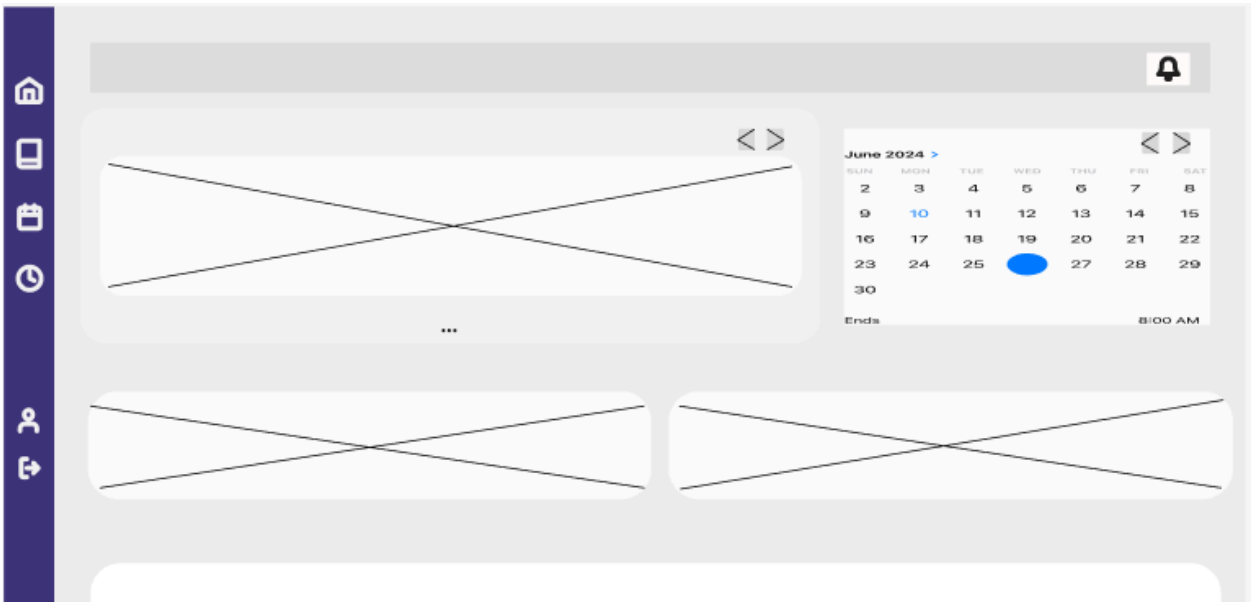
### 3.1.6 Wireframe Design



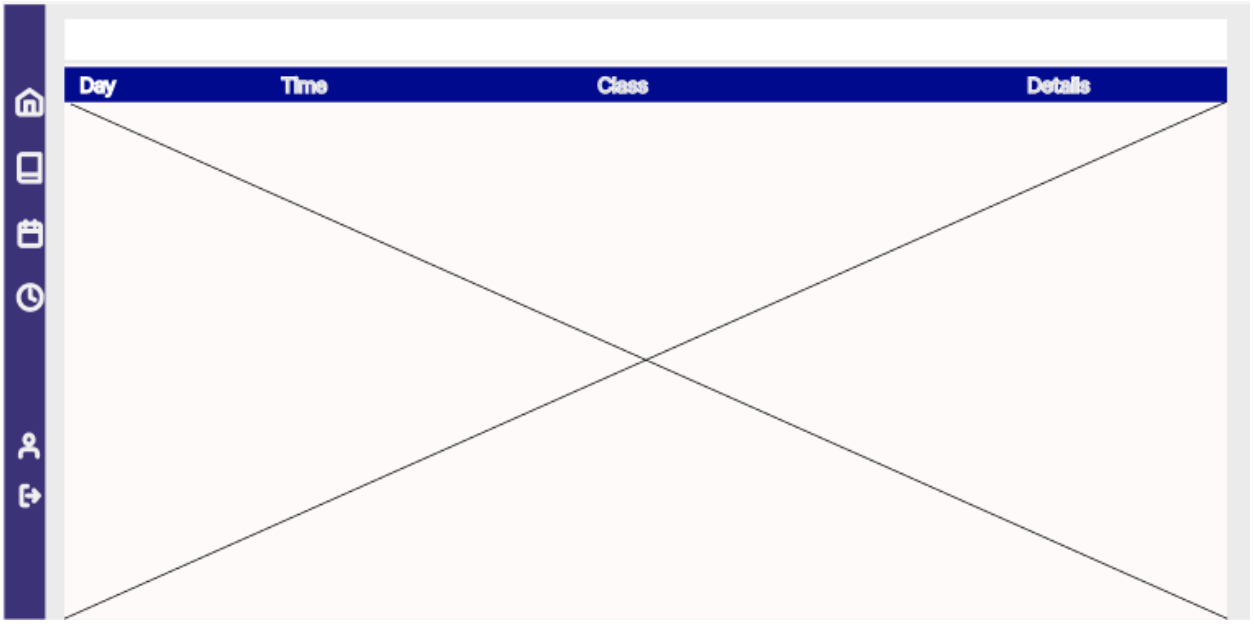

*Wireframe Layout 1: Login Page*



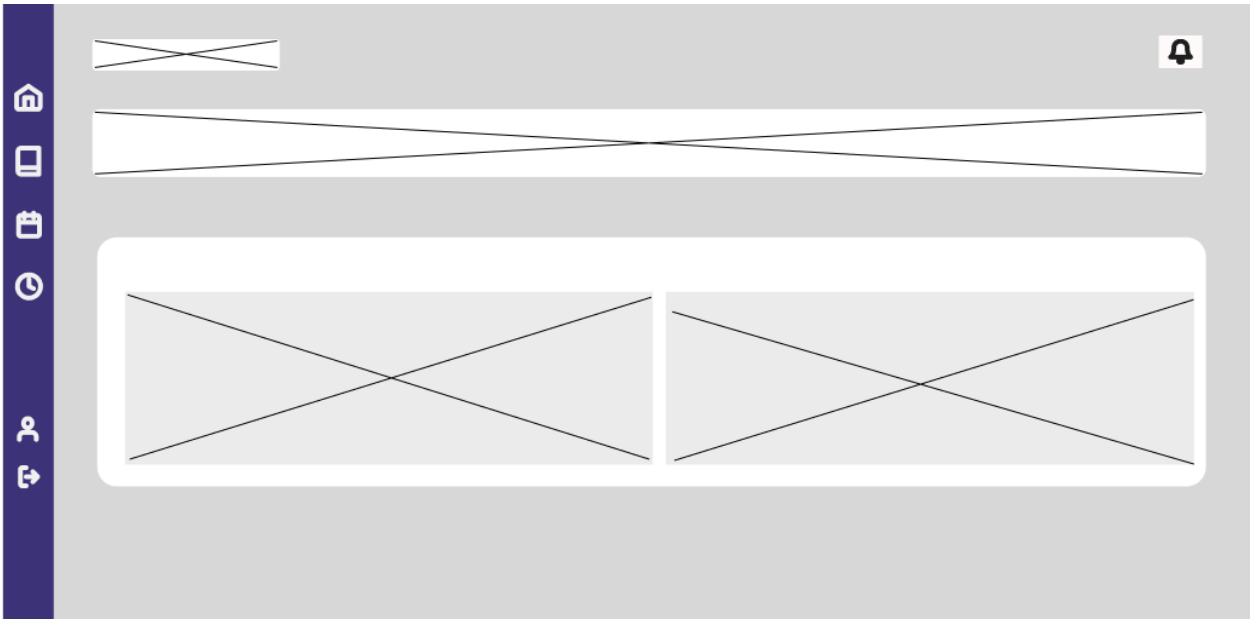

*Wireframe Layout 2: Registration Form Page*




*Wireframe Layout 3: Dashboard Page*




*Wireframe Layout 4: Schedule*

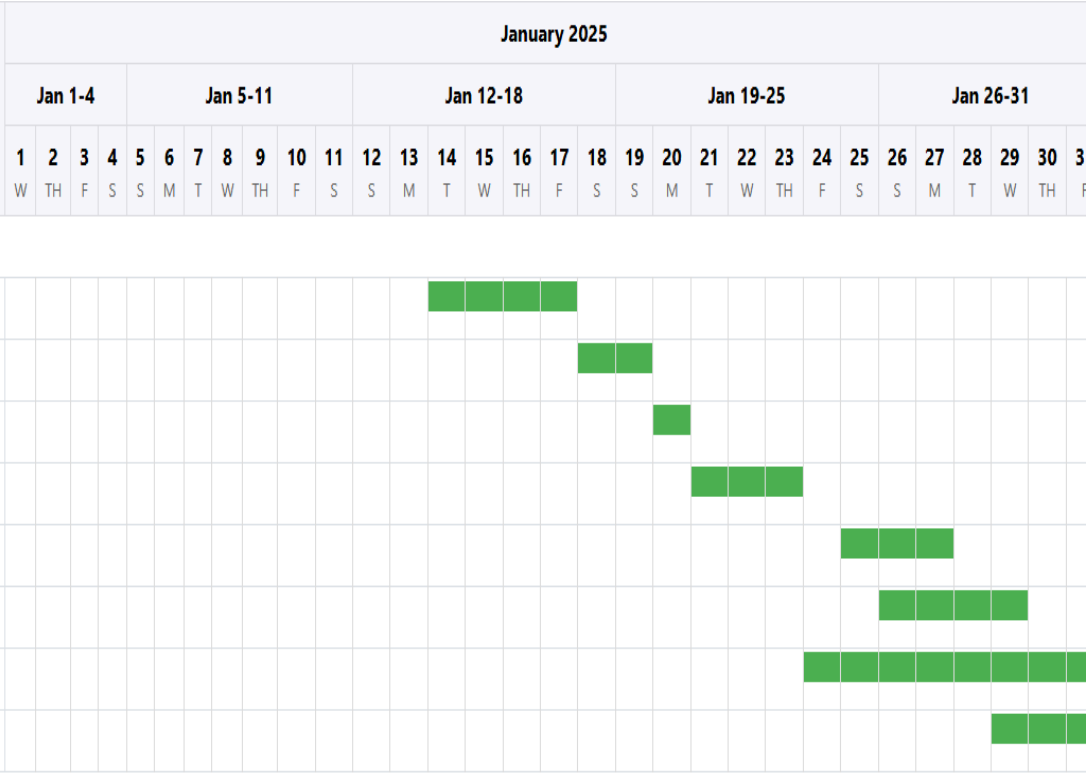


*Wireframe Layout 5: Student Course Page*

### 3.2 Calendar of Activities
### 3.2.1 Gantt Chart

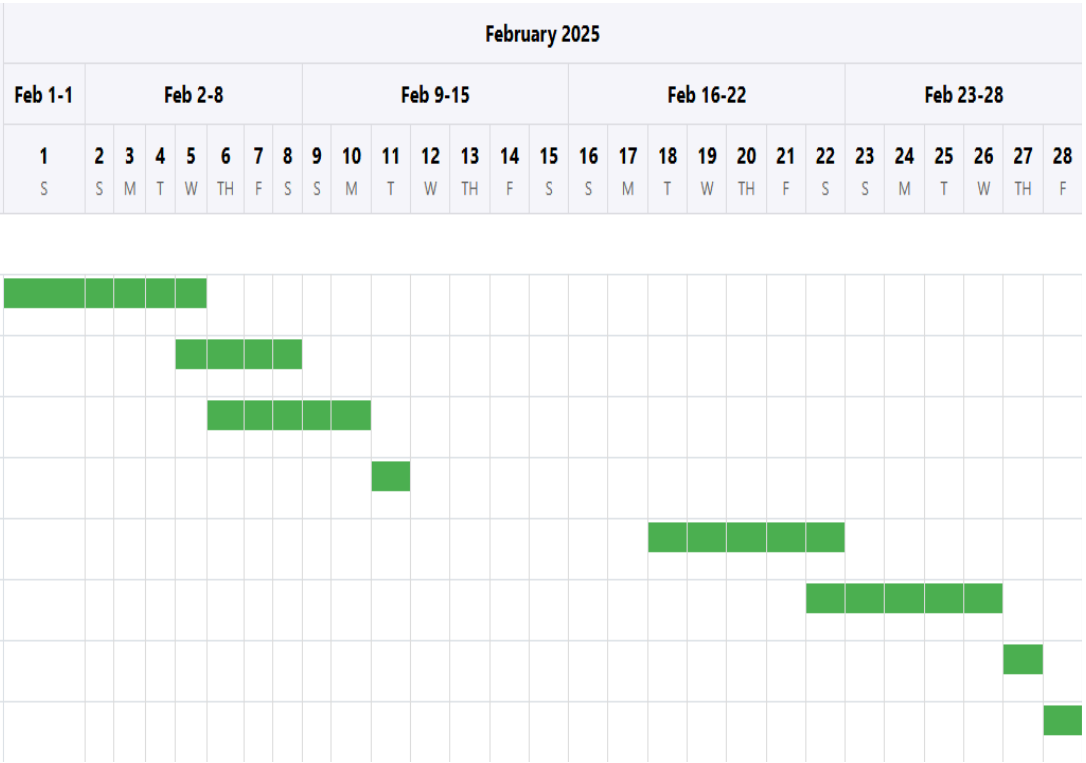
**JANUARY**
**ANALYSIS & QUICK DESIGN**

| # | Tasks / Milestones | # of Days | PIC | Status | Start Date | End Date |
|---|---|---|---|---|---|---|
| | **Analysis & Quick Design** | | | | | |
| 1 | **Specify the needs for the project** | 4 days | ALL | Completed | 2025-01-14 | 2025-01-17 |
| 2 | **Recognizing important characteristics** | 2 days | ALL | Completed | 2025-01-18 | 2025-01-19 |
| 3 | **Assigning functions to the team** | 1 days | Macuto | Completed | 2025-01-20 | 2025-01-20 |
| 4 | **Documentation** | 3 days | Bustria, Rivera | Completed | 2025-01-21 | 2025-01-23 |
| 5 | **Wireframing** | 3 days | Bustria | Completed | 2025-01-25 | 2025-01-27 |
| 6 | **Designing the user interface** | 4 days | Bustria | Completed | 2025-01-26 | 2025-01-29 |
| 7 | **Design Database Structure** | 8 days | Vidal, Macuto | Completed | 2025-01-24 | 2025-01-31 |
| 8 | **Designing Tappy Layout** | 3 days | Bustria, Rivera | Completed | 2025-01-29 | 2025-01-31 |



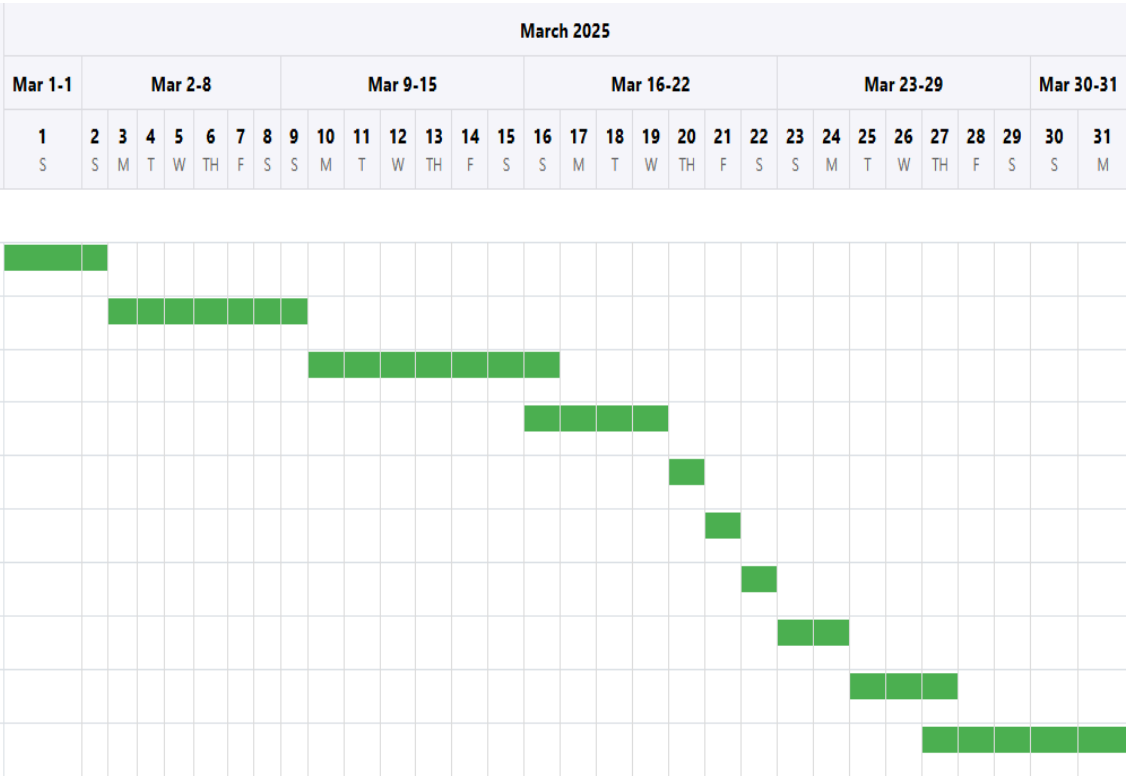
**FEBRUARY**
**DEVELOP (BUILDING THE PROTOTYPE)**

| # | Tasks / Milestones | # of Days | PIC | Status | Start Date | End Date |
|---|---|---|---|---|---|---|
| | **Develop (Building the Protoype)** | | | | | |
| 1 | **Construct User Log in & Sign up** | 5 days | Vidal | Completed | 2025-02-01 | 2025-02-05 |
| 2 | **Develop Button Functions** | 4 days | Vidal | Completed | 2025-02-05 | 2025-02-08 |
| 3 | **Set up Database Connectivity** | 5 days | Macuto | Completed | 2025-02-06 | 2025-02-10 |
| 4 | **Consultation of Chapter 1** | 1 days | ALL | Completed | 2025-02-11 | 2025-02-11 |
| 5 | **Finding Foreign Literature** | 5 days | ALL | Completed | 2025-02-18 | 2025-02-22 |
| 6 | **Finding Local Literature** | 5 days | ALL | Completed | 2025-02-22 | 2025-02-26 |
| 7 | **Synthesis** | 1 days | Bustria | Not Started | 2025-02-27 | 2025-02-27 |
| 8 | **Chapter 1 Revision** | 1 days | Bustria | Not Started | 2025-02-28 | 2025-02-28 |



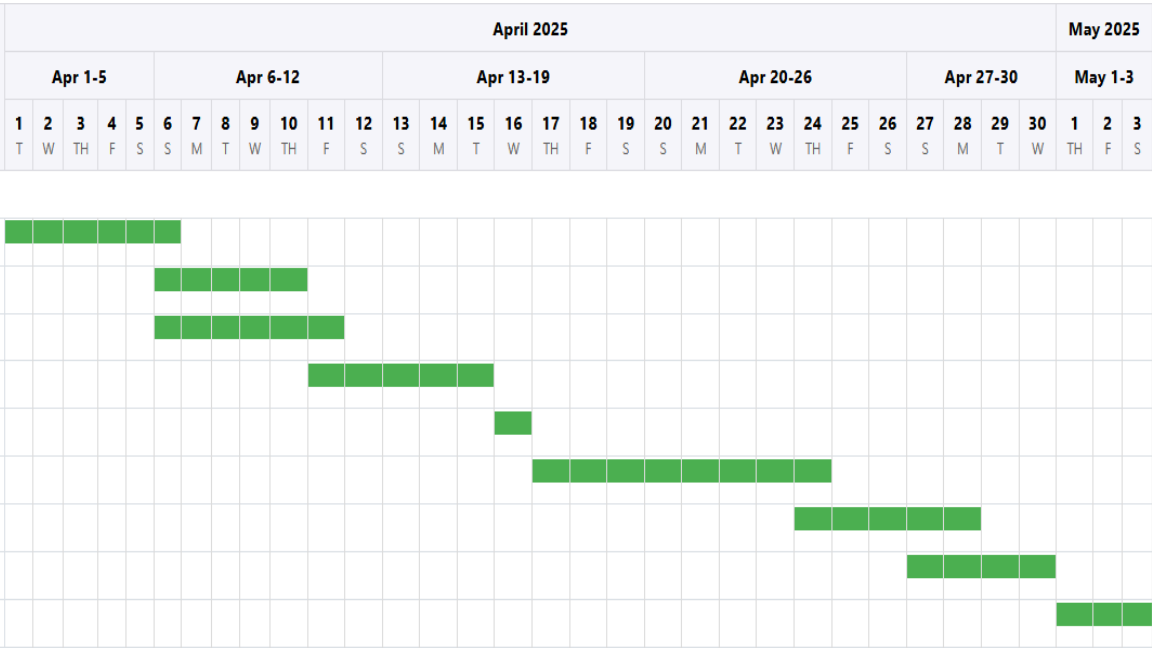
**MARCH**
**REFINE (MAKING IMPROVEMENTS)**

| # | Tasks / Milestones | # of Days | PIC | Status | Start Date | End Date |
|---|---|---|---|---|---|---|
| | **Refine (Making Improvements)** | | | | | |
| 1 | **Test Updated Features Functionalities** | 2 days | ALL | Completed | 2025-03-01 | 2025-03-02 |
| 2 | **Conduct Database Validation** | 7 days | Macuto | Completed | 2025-03-03 | 2025-03-09 |
| 3 | **Fix Bugs and Optimize Performance** | 7 days | ALL | Completed | 2025-03-10 | 2025-03-16 |
| 4 | **Methodology of the Study** | 4 days | Bustria, Rivera | Completed | 2025-03-16 | 2025-03-19 |
| 5 | **Theoretical Framework** | 1 days | Bustria | Not Started | 2025-03-20 | 2025-03-20 |
| 6 | **IT Theories** | 1 days | Rivera | Completed | 2025-03-21 | 2025-03-21 |
| 7 | **Non-IT Theories** | 1 days | Bustria | Completed | 2025-03-22 | 2025-03-22 |
| 8 | **Hierarchy Chart** | 2 days | Rivera | Completed | 2025-03-23 | 2025-03-24 |
| 9 | **Data Flow Diagram** | 3 days | Rivera | Completed | 2025-03-25 | 2025-03-27 |
| 10 | **Entity Relationship Diagram** | 5 days | Rivera | Completed | 2025-03-27 | 2025-03-31 |



## APRIL - MAY
## TEST (ENSURING SYSTEM RELIABILITY & STABILITY)

| # | Tasks / Milestones | # of Days | PIC | Status | Start Date | End Date |
|---|---|---|---|---|---|---|
| | **Test (Ensuring System Reliability & Stability)** | | | | | |
| 1 | **Updating Wireframe Design** | 6 days | Bustria | Completed | 2025-04-01 | 2025-04-06 |
| 2 | **Hardware Requirements** | 5 days | Bustria | Completed | 2025-04-06 | 2025-04-10 |
| 3 | **Software Requirements** | 6 days | Rivera | Completed | 2025-04-06 | 2025-04-11 |
| 4 | **People Requirements** | 5 days | Rivera | Completed | 2025-04-11 | 2025-04-15 |
| 5 | **Chapter 3 Consultation** | 1 days | ALL | Completed | 2025-04-16 | 2025-04-16 |
| 6 | **Chapter 3 Revision** | 8 days | Bustria, Rivera | Completed | 2025-04-17 | 2025-04-24 |
| 7 | **Testing & Debugging** | 5 days | ALL | Completed | 2025-04-24 | 2025-04-28 |
| 8 | **Optimizing Database** | 4 days | Macuto | Completed | 2025-04-27 | 2025-04-30 |
| 9 | **Updating Documentation & System** | 3 days | ALL | Completed | 2025-05-01 | 2025-05-03 |



### 3.3 Resource

In current research, the reliability and accessibility of outcomes are of paramount importance. A key factor in ensuring reproducibility is the comprehensive specification of hardware and software requirements. This enables other researchers to precisely replicate the environment and conditions under which the original research was conducted, thereby verifying the results. This paper focuses on the development and evaluation of a web-based system, along with its hardware and software prerequisites, to facilitate the replication of this work.

#### 3.3.1 Hardware Requirements

#### 3.3.2 Software Requirements

The following are the Software Requirements of the system:

- **The Visual Studio Code (VS Code):** is Microsoft's free, open-source, and lightweight code editor. There are a number of programming languages that it supports, including JavaScript, and C++, and it is widely used across a variety of platforms, including Windows, macOS, and Linux.
- **Google Chrome:** Google Chrome is a free web browser developed by Google. It is used for accessing web pages on the internet and is essential for testing the web-based components of the system.
- **Operating System:** The development and testing environment will run on Windows 8 and above. This ensures compatibility with the aforementioned software tools and provides a stable platform for development activities.

#### 3.3.3 Peopleware Requirement

- **IT LITERATE:** will be the one who handles the entire system. His/her role is to manipulate data inside of the system.