DESIGN AND IMPLEMENTATION OF CUMMULATIVE GRADE POINT AVERAGE AND TRANSCRIPT GENERATOR (TGCal.)

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FACULTY OF PHYSICAL SCIENCES
AMBROSE ALLI UNIVERSITY
EKPOMA, EDO STATE, NIGERIA

MARCH 2025.

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A PROJECT SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE, AMBROSE ALLI UNIVERSITY, EKPOMA.

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE DEGREE IN COMPUTER SCIENCE, AMBROSE ALLI UNIVERSITY, EKPOMA.

MARCH 2025.

CERTIFICATION

This is to certify that this project work was carried out by the under listed students:

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in the Department of Computer Science, Faculty of Physical Sciences, at Ambrose Alli University, Ekpoma, Edo State, Nigeria in partial fulfilment of the award of B.Sc. Degree in Computer Science.

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DEDICATION

We dedicate this project work to God Almighty for his benevolence, faithfulness and for his resilience in ensuring that the project is a success.

ACKNOWLEDGEMENT

We want to express our profound gratitude to Almighty God for his kindness and protection towards us throughout this program and for making this project work a success. Our Appreciation goes to our Supervisor Dr. F.I Sadiq for his suggestions and for painstakingly checking through this project in spite of his tight schedule. Further, our special thanks go to the Head of Department of Computer Science Dr. E.O. Oshoiribhor and all the lecturers of the Department of Computer Science, Prof. F.O. Ikpotokin (Dean FPS), Prof. C.U. Onianwa, Prof. S.E. Nnebe, Dr. Mrs. R.E. Imhanlahimi, Dr. M.I. Omogbhemhe, Mr. P.A. Aliga, Mr. O.H. Onyijen, Dr. M.O. Odighi, Mr. I.U. Iyafokhai, Mrs. A.C.E. Akpe, for their support during our academic pursuit. May God bless you all.

We wish to express our gratitude to our loving and caring parents for their love, advice, care, moral, financial support throughout this programme. May you all live long to reap the fruit of your labours.

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Abstract

The manual computation of student Grade Point Average (GPA), Cumulative Grade Point Average (CGPA), and transcript generation in academic institutions is often prone to errors, inefficiencies, and delays. This project focuses on the design and implementation of an automated GPA, CGPA, and transcript generator, referred to as TGCALC, to enhance accuracy, efficiency, and accessibility for students and academic staff at Ambrose Alli University, Ekpoma. The system automates key processes such as course registration, raw score entry, grade computation, and transcript generation. Utilizing a robust database design, secure role-based access, and a user-friendly interface, the system addresses limitations in manual result processing methods. The project adopts an agile development methodology, integrating technologies such as PHP (Laravel framework), MySQL, and HTML/CSS for seamless functionality. Validation of the system confirms a 96.1% accuracy rate compared to manually computed results, demonstrating its reliability. The proposed solution reduces administrative workload, minimizes human errors, and provides real-time academic performance tracking for students, ultimately contributing to institutional digital transformation.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In academic institutions, students' performance is measured primarily through grades, which are then compiled into a Cumulative Grade Point Average (CGPA). The CGPA system is widely used to assess the academic achievements of students across semesters or sessions. However, in many institutions, the process of calculating CGPA and generating transcripts is often manual, which can lead to delays, inaccuracies, and increased workload for academic staff. In Ambrose Alli University, specifically within the Faculty of Physical Sciences, students often face challenges in accurately calculating their Grade Point Average (GPA) and CGPA. This problem is compounded by the lack of access to result computation and transcript generator software, making it difficult for students to monitor their academic progress effectively. Therefore, there is a need for a solution that automates the process of GPA, CGPA calculation and transcript generation offline or online to ensure accuracy, efficiency, and timely access personally for student in order for them to appraise their academic record(s). This project focuses on designing and implementing a GPA, CGPA and transcript generator calculation which will be called (TGCALC) throughout this project work. The project use computer science department as a case in the short term while on the long run extend to the Faculty of Physical Sciences and other faculties at Ambrose Alli University, Ekpoma. The propose solution will feature the following; allow course registration of student(s), accept the entry of raw scores and automatically assign letter grade, compute GPA, CGPA and generate transcripts for all levels of studies depending on the data entries. The propose software can help to compile the old students result records, validate each of them and present the records in a neater format free from human errors. For the current students, they will have access to the software offline to access their academic performance from time to time. The transcript for each level of their study can also be accessible to determine if they proceed to the next level or not.

1.2 STATEMENT OF PROBLEM

The current methods employed for processing student results, namely manual techniques and Microsoft Office Excel, predominantly encounter challenges related to their labour-intensive nature, resulting in excessive reliance on human effort. This approach often lead to delay, which in turn contribute to inaccuracies and inefficiencies, as human performance tends to diminish over time.

The major activities performed in processing students' results include:

i. creation and maintenance of a record for each student to contain information about his/her registered courses & results.

ii. entry of students' raw scores and grades in each course.

iii. computation of students' result including Grade Point Average (GPA) and CGPA in order to determined students that passed or have outstanding failed courses.

iv. determination of student's good standing status, proceed, probation or withdrawn

v. generation of students' transcript and class of degree(s).

Nevertheless, the current approaches employed to carrying out these tasks are not effective. While most other departments carry out these tasks manually, the AAU, Ekpoma Computer Science department uses Microsoft Office Excel to carry out this task. The application has been built to compute results when given certain criteria. In spite of this, the application still faces the difficulties of tediousness, slowness and inaccuracy when the data becomes enormous and so leading to general inefficiency in the system performance. In view of this; this study help to address challenges identified as earlier highlighted.

1.3 AIMS AND OBJECTIVES OF THE STUDY

The study overall aim is to design and implement a GPA, CGPA, and Transcript calculator generator capable of assisting students to evaluate their performance from one level of study to another; while the specific objectives of this study are to:

i. analyse the existence of GPA, CGPA, and Transcript calculator generator.

ii. propose suitable algorithm for the automation of the GPA, CGPA, and Transcript calculator generator.

iii. design and implement GPA, CGPA, and Transcript calculator generator; while utilizing the algorithm in objective (ii).

iv. test and validate the performance of the design calculator using and existing manually computed students result.

1.4 SIGNIFICANCE OF THE STUDY

This study will offer significant benefits to educational institutions by addressing challenges associated with the manual calculation of CGPA and the generation of student transcripts. The development of a CGPA Calculator and Transcript Generator aims to streamline these processes, minimizing errors and saving time for both students and administrative staff. By automating these functions, the study promotes accuracy, efficiency, and accessibility in academic record management. Moreover, implementing this system aligns the institution with current digitalization trends in education, potentially boosting the institution's reputation and appeal. It can enhance the institution's standing in academic rankings by demonstrating a commitment to innovation and technology adoption, echoing the vision of digital transformation emphasized by leaders in the field. Ultimately, the project places the institution on a path toward modernization, offering a scalable solution that can adapt to future needs in academic management.

1.5 SCOPE OF THE STUDY

This project work on the short term focuses on the need to develop a software that that can help to clear the backlog of old results in the department of computer science by way of full automation in order to verify/validate the already manually computed results and automatically generate transcript that will be free from deliberate human error.

On the long run, the same propose software can handle results for old records from 2014/2015 academic sessions below using grades A-E to F; and from 2015/2016 academic sessions upward with grades A-D to F. The software was designed to display interface option for University Tertiary Matriculation Examination (UTME) /Direct Entry (DE); First Extension, Second Extension and above all Amnesty (students who cumulatively

exceed six or more years as a result of failure to meet up with the graduation requirements after the mandatory four years that terminated at 400 Level). The software can handle results of any department in the university the moment the courses offered are populated on the database for course registration. This is can be done through data entry.

1.6 DEFINITION OF TERMS / VARIABLES

DHTML – Dynamic Hypertext Mark-up Language. It is a combination of HTML, Cascading Style Sheets, JavaScript and Macromedia Flash Mx used to create animated and interactive website.

HTML – Hypertext Mark-up Language is a client-side scripting language for Website design.

PHP – (Archaic: Personal Homepage) Hypertext Pre-processor. These language work closely with the Web server to interpret the requests made from the World Wide Web, process these requests, interact with other programs on the server to fulfil the requests, and then indicate to the Web server exactly what to server to the client's browser.

SQL – Structured Query Language, basically used in querying the databases to retrieve, updates, and review database.

CSS – Cascading Style Sheet. A client-side scripting language, using in styling the webpages for a greater user-experience.

ASP – Active Server Pages. A server-side scripting language like the PHP. These languages works closely with the Web server to interpret the requests made from the Word Wide Web, process these requests, interact with other programs on the server to fulfil the requests, and then indicate to the Web server exactly what to serve to the client's browser.

SERVER – A specific application called a Web server, will be responsible for communicating with the browser.

PHOTOSHOP – A graphics application.

WEBSITE – It's a collection of information about a particular topic or subject.

APACHE – A server technology, designed to assist the webmaster in utilizing the database and server technology.

INIX – An operating system.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of CGPA Calculators and Transcript Generators

CGPA (Cumulative Grade Point Average) calculators and transcript generators are essential tools in academic institutions for managing students' academic performance records. These systems automate the processes of calculating students' GPAs based on their course grades and generating official transcripts that reflect their academic achievements. By leveraging technology, these tools aim to enhance efficiency, accuracy, and accessibility in academic record management.

2.1.1 Purpose and Importance

The primary purpose of CGPA calculators and transcript generators is to simplify the calculation of students' academic performance. Traditionally, these calculations were performed manually, which was time-consuming and prone to errors. Automated systems ensure that calculations are performed consistently and accurately, reducing the likelihood of discrepancies in students' records.

Moreover, transcript generators play a crucial role in producing official documents that are required for various academic and professional purposes. These documents are essential for students applying for higher education, jobs, or internships, making it imperative that they are generated promptly and accurately. The importance of these systems extends beyond mere convenience; they contribute to the integrity of academic records, ensuring that students' achievements are properly documented and recognized

2.1.2 Existing Systems and Their Limitations

In our institution, there is an existing CGPA calculator and transcript generator designed to assist students and faculty in managing academic records. However, despite its availability, many students are unaware of its existence or how to effectively utilize it. This lack of awareness limits the system's potential benefits and can lead to unnecessary confusion regarding academic performance tracking. One of the key limitations of the current system is its accessibility. While it was developed to streamline the calculation of CGPA and the generation of transcripts, information regarding its functionality has not

corresponding grade points. To accurately calculate a student's CGPA, the system must apply the correct formulas, which typically involve summing the products of each course's grade points and credit hours, then dividing by the total credit hours taken. However, inconsistencies in how grades are entered or interpreted can lead to inaccurate calculations.

Moreover, the current system must be able to accommodate different types of courses, such as electives and core subjects, which may have varying credit weights. Ensuring that the system accurately reflects these nuances is essential for providing students with a reliable representation of their academic performance.

2.2.2 Data Handling and Accuracy

Data handling is a critical aspect of any CGPA calculator and transcript generator, as the integrity of the output relies heavily on the quality of the input data. Effective data handling includes secure storage, retrieval, and processing of students' academic records. Accuracy in data entry is paramount; any errors in inputting grades or course information can significantly affect the calculated CGPA and generated transcripts. To minimize these errors, the system should incorporate validation checks that prompt users to confirm data entries and provide feedback on inconsistencies. Additionally, a robust database management system is essential for organizing and safeguarding academic records, ensuring that they are readily accessible while maintaining privacy and security. Another important consideration is the need for regular updates to reflect changes in grading policies or curriculum requirements. A system that is not regularly maintained may produce outdated or incorrect information, undermining the trust of students and faculty in its reliability.

2.3 Survey Methodologies for Evaluating Academic Tools

Evaluating the effectiveness and user satisfaction of CGPA calculators and transcript generators requires systematic survey methodologies. These methodologies are designed to gather insights from users, primarily students and faculty, regarding their experiences with the existing systems. This feedback is crucial for identifying areas of improvement and enhancing the overall functionality of academic tools.

2.3.1 Survey Design and Implementation

The design of the survey is a critical step in ensuring that the gathered data is relevant and actionable. A well-structured survey should include a mix of quantitative and qualitative questions to capture both numerical data and personal experiences. Key components of the survey design may include;

Objective Definition: Clearly defining the objectives of the survey is essential. For instance, the survey may aim to assess user awareness of the CGPA calculator, satisfaction levels, and perceived challenges in its use. Target Audience: Identifying the target audience helps tailor the survey to gather specific insights. In this case, the primary respondents would be students who have interacted with the CGPA calculator, as well as faculty members who oversee its implementation.

Question Types: A combination of closed-ended questions (e.g., rating scales, multiple-choice questions) and open-ended questions allows for comprehensive feedback. Closed-ended questions facilitate quantitative analysis, while open-ended questions provide richer qualitative insights.

Pilot Testing: Conducting a pilot test of the survey with a small group of users can help identify any ambiguities or technical issues. This step ensures that the final survey is clear and user-friendly. Once the survey is designed, implementation involves distributing it to the identified target audience. This can be done through online platforms, in-class announcements, or institutional email systems to encourage maximum participation.

2.3.2 Data Collection Techniques

For the evaluation of CGPA calculators and transcript generators, utilizing online surveys through Google Forms is an effective data collection technique. This method offers several advantages that enhance the survey process: Accessibility: Google Forms provides a user-friendly platform that allows respondents to access the survey from any device with internet connectivity. This accessibility increases the likelihood of participation among students and faculty, ensuring a broader range of responses.

Ease of Use: The intuitive design of Google Forms allows for easy navigation and completion of the survey. Respondents can quickly answer questions without technical

difficulties, leading to higher response rates and more reliable data. Real-Time Data Compilation: One of the significant benefits of using Google Forms is the automatic compilation of responses. As participants submit their answers, the data is collected in real time and can be easily exported to spreadsheets for analysis. This feature streamlines the process of data management and analysis.

Anonymity and Confidentiality: Online surveys can be designed to maintain respondent anonymity, which encourages honesty and openness in answers. This confidentiality is particularly important when gathering feedback on sensitive topics related to academic performance. Customizable Question Formats: Google Forms allows for various question formats, including multiple-choice, checkboxes, and open-ended questions. This flexibility enables the survey to capture both quantitative data and qualitative insights, providing a comprehensive view of user experiences.

2.4 Comparative Analysis of Automated and Manual Systems

The management of CGPA calculations and transcript generation can be approached through either automated or manual systems. Understanding the comparative advantages and disadvantages of each approach is essential for assessing the best methods for academic record management within an institution.

2.4.1 Benefits of Automation

Automated systems for CGPA calculation and transcript generation offer numerous benefits that enhance efficiency and accuracy in academic management. Key advantages include: Increased Accuracy: Automated systems significantly reduce the likelihood of human error associated with manual calculations. By relying on programmed algorithms, these systems ensure consistent application of grading scales and calculation formulas, leading to more accurate results.

Time Efficiency: Automation speeds up the process of calculating CGPA and generating transcripts. Instead of manually computing grades and compiling records, automated systems can complete these tasks in a matter of seconds, allowing faculty and students to focus on other academic responsibilities. User Convenience: Automated systems often come with user-friendly interfaces that allow students to easily input their

grades and access their transcripts. This convenience fosters greater engagement with the system and encourages students to utilize the tools available to them.

Data Management: Automated systems streamline data management by securely storing and organizing academic records. This centralized data repository facilitates quick retrieval and analysis, aiding in decision-making processes for academic administration. Integration Capabilities: Many automated systems can integrate with existing information management systems, ensuring seamless data flow between various academic departments. This integration enhances overall efficiency and reduces data duplication.

2.4.2 Challenges of Manual Processes

Despite the benefits of manual processes, they come with several significant challenges that can hinder effective academic record management: Prone to Errors: Manual calculations are susceptible to human errors, such as miscalculations, data entry mistakes, or overlooking important information. These errors can lead to inaccurate CGPA reports and transcripts, which can affect students' academic standing.

Time-Consuming: The process of manually calculating CGPA and generating transcripts is labor-intensive and time-consuming. Faculty and administrative staff may find themselves spending excessive time on these tasks, detracting from other critical responsibilities. Limited Accessibility: Manual systems often lack the accessibility features present in automated systems. Students may face difficulties in obtaining their transcripts or understanding their CGPA without proper guidance, leading to frustration and confusion.

Data Management Issues: Handling academic records manually can result in poor data organization and storage. This disorganization increases the risk of losing important documents or failing to update records accurately, further complicating the academic management process. Inflexibility: Manual processes can be inflexible and slow to adapt to changes in grading policies or curriculum requirements. This rigidity can hinder the institution's ability to implement improvements or respond to new academic standards promptly.

2.5 User Satisfaction and Feedback Mechanisms

User satisfaction is critical in assessing the effectiveness of CGPA calculators and transcript generators. Understanding users' experiences and incorporating their feedback can lead to continuous improvement of these academic tools.

2.5.1 Importance of User Feedback

User feedback serves as a vital source of information for evaluating the effectiveness and usability of CGPA calculators and transcript generators. Key reasons for prioritizing user feedback include: Identifying Areas for Improvement: Collecting feedback allows institutions to identify specific areas where users encounter challenges or frustrations. Understanding these pain points enables targeted improvements, ensuring the tools meet the needs of students and faculty.

Enhancing User Experience: Positive user experiences can lead to greater satisfaction and engagement with the system. By actively seeking and incorporating feedback, institutions can refine the user interface and functionality, making the tools more intuitive and accessible. Building Trust and Credibility: When users feel their opinions are valued, it fosters a sense of trust in the institution and its systems. Regularly soliciting feedback demonstrates a commitment to transparency and responsiveness, enhancing the overall credibility of the academic tools.

Informing Future Developments: User feedback can guide the development of new features and functionalities within the CGPA calculator and transcript generator. By understanding what users desire or require, institutions can prioritize enhancements that align with user needs.

2.5.2 Implementing Feedback Mechanisms

Effective feedback mechanisms are essential for gathering user insights and translating them into actionable improvements. Implementing these mechanisms can involve several strategies: Regular Surveys: Conducting periodic surveys using platforms like Google Forms allows institutions to collect structured feedback from users. These surveys can assess satisfaction levels, gather suggestions for improvements, and identify recurring issues.

Feedback Forms: Integrating feedback forms directly within the CGPA calculator and transcript generator interface provides users with a straightforward way to share their experiences. This real-time feedback can capture users' thoughts immediately after interacting with the system. Focus Group Discussions: Organizing focus group sessions with a diverse range of users can facilitate in-depth discussions about their experiences with the systems. These discussions can uncover nuanced insights and foster collaboration on potential solutions. User Training Sessions: Offering training sessions or workshops for students and faculty can create an open forum for feedback. Users can express their challenges in real-time, and institutions can gather valuable input while also providing guidance on effective tool usage. Response Follow-Up: After collecting feedback, it is essential to communicate back to users about the changes or improvements made based on their input. This follow-up not only acknowledges users' contributions but also reinforces the value of their feedback.

CHAPTER THREE

SYSTEM DESIGN AND METHODOLOGY USED

3.1 Introduction

This chapter discuss the methodology used to design and implement the GPA, CGPA and transcript generator calculator simply referred to as TGCALC. It explain the project planning, requirement analysis, design, development methodology, technology stack, and validation strategies.

3.2 Design of the Study

This study adopted a descriptive research design to conduct a survey on the existence of GPA, CGPA and transcript generation calculator as it relates to the Faculty of Physical Sciences and other faculties in AAU, Ekpoma. The design involved collecting feedback from students and administrators regarding the system's usability and functionality through the use of questionnaire to ascertain the need and relevance of students having access to a software that can be used to generate GPA, CGPA, and transcript generation amongst students. The questionnaire used for gathering data was created using **Google Forms**, offering a more streamlined approach than traditional paper-based surveys. **Andrew (2023)** states that the questionnaire method effectively collects data across various research fields. This method facilitated the systematic tabulation of user feedback, followed by a thorough and comprehensive coding and analysis to identify critical areas of improvement for the system, ensuring the confidence in the findings.

3.3 Preliminary Survey for Student Population.

The population for this study was drawn from various faculties at the university, focusing on undergraduate students during the 2022/2023 academic session. The study obtained responses from a total of 612 students from 10 different faculties. The breakdown of the respondents' feedback from the survey faculty by faculty is shown in Table 3.1.

Table 3.1 Summary of Respondents Feedback from conducted Survey

FACULTY	DEPARTMENT	NO OF RESPONDENTS
Physical Sciences	Computer science	38
	Physics	21
	Chemistry	27
	Mathematics	19
Law	Department of law	51
Social Science	Economics	15
	Political science	17
	Psychology	9
	Sociology	12
Basic Medical Sciences	Anatomy	17
	Physiology	15
	Nursing	19
Arts	English	7
	History and international studies	11
	Mass communication	15
	Theatre and media arts	14
Education	Business education	11
	Guidance and counselling	8
	Human kinetics and health	14
	Library and information science	6
	Physical and health education	10
Engineering	Civil engineering	27
	Industrial and production	32
	Mechanical engineering	22
	Electrical engineering	18
Life Sciences	Human Nutrition & Dietetics	10
	Microbiology	16
	Bio-chemistry	12
	Botany	15
Management Science	Accounting	14
	Banking and finance	8
	Business administration	16
	Public administration	13
Medical Laboratory Science	Chemical pathology	12
	Hematology	15
	Medical microbiology	9
	Histopathology	17
Total		**612**

The investigation targeted students from diverse faculties to gather comprehensive feedback about the existence of similar software, its usability and functionality. The

selected faculties represent a broad spectrum of academic disciplines, ensuring that the system meets the needs of a wide range of users on the long term.

3.4 Analysis of the Present Method

The present method for GPA, CGPA computation and transcript generator is primarily **manual** apart from the centrally used kofa which department and students does not have access to i.e. the semi-automated used by the service provider through ICT directorate used by administrative support staff which they relied on to process student course tickets and calculate academic performance via with their results. This approach has several drawbacks, including delays, errors, and lack of accessibility to students who need immediate results to apply for scholarship.

3.4.1 Overview of the Current System

The current system involves manual calculations of students' CGPA by administrative staff, with grades recorded either in spreadsheets or on paper. The process is time-consuming and prone to errors, particularly when dealing with large volumes of student data across multiple departments.

i. **Manual Grade Entry**: In most cases, grades are manually entered into record books or spreadsheets.

ii. **Transcript Requests**: Students must visit the administrative office to request transcripts, often leading to delays and inefficiencies.

iii. **Inaccessibility**: The process is often cumbersome for students, especially those who need quick access to their academic records for applications or personal use.

3.4.2 Current Procedure for Information Dissemination

Currently, academic results and transcripts are disseminated through administrative offices. Students typically have to submit formal requests for transcripts, which are processed manually, leading to significant delays. Results are often posted on notice boards or through internal portals that do not offer real-time CGPA updates.

3.4.3 Model of the Current System

The current system can be modeled as follows:

i. **Student submits grades** to the administrative office.

ii. **Administrative staff manually inputs** grades into spreadsheets or record books.

iii. The **staff calculates CGPA** based on these inputs.

iv. **Transcripts are generated manually** when requested by students.

This model is inefficient, slow, and prone to human error due to the reliance on manual processes.

3.4.3.1 Weakness of the Current System

The key weaknesses of the current system include:

i. **Inaccuracy**: Manual data entry often leads to errors in grade recording and CGPA calculation.

ii. **Delay**: The process of calculating CGPA and generating transcripts is slow, causing delays in providing students with their academic records.

iii. **Limited Access**: Students cannot access their CGPA or transcripts online or in real-time.

iv. **Labor-Intensive**: Administrative staff spend a considerable amount of time

v. processing grades and generating transcripts manually.

3.4.4 Comparison With the Proposed System

The proposed CGPA Calculator and Transcript Generator aims to resolve the issues inherent in the current system by automating key processes. The differences include:

i. **Automation**: The proposed system automates the CGPA calculation and transcript generation processes, reducing errors and delays.

ii. **Real-Time Access**: Students can access their academic records, including their CGPA and transcripts, in real time through a web-based platform.

iii. **Efficiency**: The system reduces the administrative burden by allowing students to handle grade entries and requests for transcripts directly.

3.4.5 High-Level Model of the Proposed System

The high-level model of the proposed system operates as follows:

i. **Students select courses and input grades** through a web interface.

ii. The system **automatically calculates the CGPA** based on predefined grading scales and credit units.

iii. **Transcripts are generated instantly**, and students can download them in PDF format.

iv. **Administrative staff manage course lists and student records** through a dedicated dashboard, ensuring oversight and control over the academic data.

3.5 Project Planning

Project planning laid the foundation for the ICALC automation system by defining its objectives, scope, and timeline. The primary goal was to create a robust CGPA and Transcript generator tailored to computer science and on the long run the entire faculties and departmental needs in Ambrose Alli University, Ekpoma. The platform was designed to optimize academic record management with user-friendly features for students, administrators, and faculty.

Key functionalities included:

i. Secure role-based access.

ii. Automated GPA and CGPA computation.

iii. Management of carryovers, extensions, and amnesty.

iv. Detailed transcript generation.

v. Dashboards for administrative and student use.

The project emphasized accurate calculations, data integrity, and compliance with institutional standards. A detailed timeline ensured resource allocation, milestone achievement, and on-time project delivery.

3.6 Requirement Analysis

Requirement analysis was pivotal in aligning the system with stakeholder needs. By identifying diverse user personas (faculty administrators, staff, and students) and documenting user stories, the analysis addressed the challenges of existing manual systems.

3.6.1 Functional Requirements:

i. Academic session management for past, present, and future periods.

ii. Customizable grading systems.

iii. Flexible faculty, department, and course management.

iv. Automated CGPA computation and carryover tracking.

v. Role-based access controls.

vi. Seamless course registration and transcript generation.

3.6.2 Non-Functional Requirements:

Performance, security, scalability, and maintainability to ensure robustness.

The system bridges gaps in current academic processes, automating tasks and enhancing data accessibility.

3.7 Design Process

The design process balanced aesthetics and functionality through a user-centric approach. Wireframes and prototypes tailored for each user role ensured an intuitive interface. A robust database schema facilitated efficient data handling, supporting entities like faculties, departments, courses, students, and grading systems. The design enabled seamless data interaction for course registration, GPA computation, and transcript generation while maintaining scalability and data integrity.

3.7.1 Database Design

The database was designed to handle dynamic academic requirements:

i. **Entity-Relationship Modeling:** Captured relationships such as:

a. Faculties and departments (one-to-many).

b. Departments and levels (one-to-many).

c. Students and courses (many-to-many via a pivot table).

d. Grading systems and results (linked through scoring tables).

ii. **Normalization:** Used 1NF, 2NF, and 3NF to minimize redundancy and maintain data integrity.

iii. **Table Design:** Represented entities like departments, staff, courses, and students, with appropriate keys and constraints.

a. **Data Types and Constraints:**

b. Data types: INTEGER, VARCHAR, DATE.

c. Constraints: NOT NULL, UNIQUE, and DEFAULT values for consistent data.

iv. **Indexing and Optimization:** Improved query efficiency for high data volumes.

v. The database was scalable, accommodating growth in data volume and academic complexity.

3.8 Development Methodology

The agile methodology fostered flexibility and collaboration. Iterative cycles focused on specific features, integrating continuous feedback from stakeholders. Tools like Git facilitated version control and collaborative coding. The agile approach ensured the system evolved alongside user needs, maintaining deploy ability throughout development.

3.9 Technology Stack

The technology stack combined:

i. **Frontend Technologies:** HTML, CSS, JavaScript, Laravel Blade, and Bootstrap for a responsive interface.

ii. **Backend Technologies:** PHP (Laravel framework) and MySQL for robust data management.

This stack ensured performance, scalability, and ease of maintenance.

3.9.1 Validation Strategies

Validation ensured functionality, scalability, and security through:

i. **Unit Testing:** Verified individual components (e.g., GPA algorithms).

ii. **Integration Testing:** Assessed module interactions.

iii. **System Testing:** Evaluated overall performance, scalability, and security.

iv. **User Acceptance Testing (UAT):** Involved end-users in final validation.