



## AI- DRIVEN EXAMS CLEARANCE SCHEME AS A PART OF THE EXISTING E-LEARNING SYSTEMS: CASE STUDY (THE INTERNATIONAL UNIVERSITY OF EAST AFRICA, AND MAKERERE UNIVERSITY)

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**ABSTRACT:** *This paper discusses an AI Driven Exam Clearance System as part of the existing eLearning System. The system recommends a criterion where a student can sit for their final year semester exams even when they have not yet cleared tuition fees of the final year 2<sup>nd</sup> semester of their program of study using students' payment history data. The software is sectioned into the accounts and faculty segments. The faculty manager handles the adding of student's attendance to the system after a student request has been made, the account manager handles the addition of the category of payment plan that the student falls into and the system validates and recommends students that meet the criterion. This system was designed to overcome the problems identified with the current eLearning System whereby many final years, and final semester students find it difficult or are unable to get permission to do their final exams with an outstanding balance. The legacy system used in the company was also studied in more detail. With this, more requirements for the AI Driven Clearance System were obtained and the system was designed and implemented. The interfaces for the module system were implemented using HTML, Bootstrap, and Java Script. MYSQL was also used for implementing the system database while Python and Django framework was used to create interactivity with the database. After the implementation, the new system was then tested, validated, re-evaluated, and then deployed.*

**KEYWORDS:** Artificial Intelligence, eLearning System, Data Analytics, Clearance System, Algorithms, Data Structures.



## INTRODUCTION

The eLearning industry has seen rapid growth in the past few years. From slideshows to Augmented Reality technology (Laura, 2021). Having gained much attention in recent times due to the Covid-19 pandemic, eLearning is increasingly becoming a crucial element of education. This chapter consists of the background, problem statement, purpose, objectives, scope, and significance of the study.

### Background of the Problem

The eLearning industry has seen rapid growth in the past few years. From slideshows to Augmented Reality technology (Laura, 2021). Having gained much attention in recent times due to the Covid-19 pandemic, eLearning is increasingly becoming a crucial element of education.

Globally, E-learning is growing, with applications from schools to non-profits to business, industry, and, of course, higher education. It has been heralded as the next democratizing force in education for offering access regardless of physical limitations, job status, and geographic location. In the United Kingdom, digital learning has become one of the most important ways people teach and learn new skills. While the social distancing measures brought about by the coronavirus (COVID-19) pandemic certainly accelerated the growth of digital learning, recent technological advances and increasing connectivity were already making digital education more widespread amongst the Britons. Between 2007 and 2019, for example, the percentage of people who said that they had taken an online course in university grew from 4 percent to 17 percent (Clark, 2021). In the United States of America (USA), online learning also known as distance education is a terrific way to experience the U.S. education system without leaving home. U.S. institutions offer a variety of full-time degree programs at undergraduate and graduate levels as well as individual courses. Classes are facilitated through a variety of methods, including websites, mobile apps, email, telephones, and more. To receive credit from a U.S. institution for distance learning, the students usually pay a tuition fee (Education USA, 2019).

In Uganda, Makerere University and other public and private universities have been using Virtual Learning Environments (VLEs) since the early 2000s. Makerere University started with Blackboard in 2003 and later moved to an instance of Moodle called Makerere University eLearning Environment (MUELE). Other universities like Makerere University Business School (MUBS), and Gulu University followed Moodle (Mayoka & Kyeyune, 2012). Due to the increased uptake of technology in many aspects of life, the benefits of blended/eLearning, and most recently the Covid-19 lockdown, private universities such as the International University of East Africa and Cavendish University Uganda have set up VLEs to support the delivery of blended learning. All-inclusive, students are responsible for paying university tuition fees. Students throughout the world struggle to pay tuition fees since education is costly. It has been well documented that investing in education is beneficial to the individual, society, and the economy, not only in pecuniary terms but also in social and psychic development (UKEssays, 2018). There are loans, scholarships, and grants to help students study around the world. However, the loans are limited in Africa and many other countries, and scholarships do not cover everyone. High schools and universities have done an excellent job in developing a payment plan to assist sponsors, parents, and students in meeting tuition obligations which have helped a lot. Due to many reasons, some students cannot still meet up with the deadlines.



The biggest reason students fail to fulfill deadlines is due to financial constraints. However, there are a variety of underlying factors that contribute to financial constraints: some students are orphans, some have fewer caring parents, some are self-supporting students, and some are from wealthy families but do not receive support because they chose a major that their parents do not approve of, and others have parents who are uninterested in their children's education. Even though they all make it to university, some finish on time, some take an extra year, and others drop out even in their final year. The overall dropout rate for undergraduate college students in the United States is 40%, according to Education Data (Hanson, 2021) .

- College first-year student who drops out before their sophomore year accounts for 30% of the dropout rate.
- Within six years of enrolling in a four-year college, 56% of students drop out.
- With 54 percent of Black students dropping out of college, they had the highest dropout rate.
- Most college dropouts, 38 percent, stated they quit due to financial pressure.

Covid has recently wreaked havoc on people's lives. With millions of people out of employment in the United States and other countries, one cost that many people can no longer afford is higher education. According to a survey by OneClass, which interviewed over 10,000 current first-year students, sophomores, and juniors from 200-plus schools and universities throughout the nation, more than half of college students, or 56 %, claim they can no longer afford their tuition bills. According to the report, over half of all undergraduates say they need to find a new way to pay for school due to the pandemic's financial impact. Furthermore, according to OneClass, 7% of students have had to drop out to pursue full-time work or other educational opportunities (Dickler, 2020). Dropout is the main cause here, although at Makerere University, for example, fees are due on the first day of each semester, and students who fail to pay their fees face punishments such as de-registration, payment of a fine, and legal action (Makerere, 2016) . To help increase the number of graduates which benefits the university and the world, we propose an AI-driven Exam clearance system that recommends a criterion where a student can sit for their final year semester exams even when they have not yet cleared tuition fees of their final year 2<sup>nd</sup> semester of their programmed of study using students' payment history data.

## LITERATURE/THEORETICAL UNDERPINNING

The E-learning industry is one of the largest and fastest growing industries in the world. The E-Learning Market size surpassed USD 250 billion in 2020 and is anticipated to grow at an exponential CAGR of over 21% between 2021 and 2027. The advent of several modern technologies, such as Artificial Intelligence, Virtual Reality, and cloud-based Learning Management systems, will drive the market growth (Market, 2020). The emergence of an AI-enabled e-learning solution will help in the development of smart content, digitized study guides, real-time questioning, and automated financial clearing. The emergence of an AI-enabled e-learning solution will help in the development of smart content, digitized study guides, real-time questioning, and automated financial clearing.



The review of the literature for this study focused on creating an AI-driven Exams Clearance System Module to be added to the current eLearning system. To create this, we needed to find some useful resources for the study.

### Definitions

- **E-learning** referred to as online learning or electronic learning, is the acquisition of knowledge that takes place through electronic technologies and media (Tamm, 2021).
- **Learning management systems (LMS):** A learning management system (LMS) is software that is designed specifically to create, distribute, and manage the delivery of educational content. The LMS can be hosted as a stand-alone product on the company server, or it can be a cloud-based platform that is hosted by the software firm (Valamis, 2019).
- **AI-based eLearning platform** is a machine/system that possesses the ability to perform different tasks requiring human intelligence. It maintains the ability to create solutions to human-related problems, like speech recognition, translations involving different languages, decision making, and much more.

### E-Learning Management Systems

Learning management systems have seen a significant increase in usage because of the emphasis on remote learning during the COVID-19 epidemic. Learning Management Systems are utilized by all types of educational institutions from K12 through Graduate school. They are also used by organizations to train their employees. Although most of these learning platforms can be used within each of these types of organizations, they do tend to cater to one or the other (Shortsleeve, 2018). Learning management systems were created to identify training and learning gaps using analytical data and reporting. LMSs are primarily used for online learning delivery, but they can also be used for a variety of other purposes, such as serving as a platform for online content such as asynchronous and synchronous courses. In general, a learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, automation, and delivery of educational courses, training programs, or learning and development programs. (Tamm, 2021)

In the higher education sector, an LMS may provide classroom management for instructor-led training or a flipped classroom. Modern LMSs include intelligent algorithms that make automated course recommendations based on a user's skill profile and extract metadata from learning components to create such recommendations even more accurately.

### Advantages of eLearning Systems

- Students are not limited to the size of the classroom.
- Saves time
- Online learning could solve teacher scarcity
- Online learning is self-paced: Students who study online can plan their schedule, without having to make personal sacrifices to meet the class attendance requirements



of teachers and traditional universities. Research has proved that self-paced learning leads to increased student satisfaction and reduced stress, resulting in improved learning outcomes for everyone involved. Some of the advantages of self-paced learning include efficiency, effectiveness, convenience, scalability, and reusability (Tamm, 2021).

- **E-Learning fully uses analytics:** Data is the new oil, and E-Learning makes use of student data much more effectively than any other form of learning in history. That is because of E-Learning Analytics. E-Learning Analytics is the extraction of valuable information from online learning management systems, and it's another one of the greatest benefits of E-Learning. With student data gained through E-Learning Analytics, educational institutions can improve their training materials and boost learning outcomes in various ways. For example, if we have data on student dropout rates, we can show potential pitfalls in our learning materials and end them. Afterward, we can gather new data and analyze whether our change was beneficial to our E-Learning outcomes or not. The value of data in education is immense, and its full potential is yet to be realized.
- **Less Impact on Environment:** Because eLearning is a paperless method of instruction, it helps to safeguard the environment to a large extent. According to a study on eLearning courses, distance-based learning programs used 90 percent less power and produced 85 percent fewer CO2 emissions than typical campus-based educational courses. There is no need to cut down trees to obtain paper using eLearning. As a result, eLearning is a very environmentally friendly method of learning. (Tamm, 2021).
- **Accommodating:** Whether you are a housewife, employee, or business owner, if you ever have an urge to learn something new, you can always go for an eLearning course. eLearning caters to everyone's needs, as it provides time flexibility and easy access to online content. You can choose your study hours and manage other tasks with eLearning.
- **Great Impact for Students with Physical Disabilities:** The most obvious benefit for physically disabled students is that they stay in their comfort zone without rushing to campus or commuting between classes to classes. There are integrated technologies for the students who cannot type such as voice-to-text and voice-activated programs.
- **For Hearing Impairments:** Students with hearing impairments can use technology to make their life easier. Through eLearning, they can view video lectures with subtitles, which they cannot experience in the classroom. The text being the primary mode of communication with the teachers and other fellow students can be an easier way of interacting through forums and emails.

### **Disadvantages of eLearning Systems**

- **Social isolation:** Along with communication issues, less social interaction causes students to experience social isolation as they spend most of their time alone getting through online lectures and attending live sessions with teachers. Studying alone in such an environment is itself stressful and difficult to be dealt with.





- Focuses more on theory: You'll spend most of your time listening to podcasts, watching videos, and looking at slide presentations. There's no hands-on experience like conducting experiments.
- It's the most modern way of learning that requires only a gadget and internet access. However, it's not for everybody. Being aware of the advantages and disadvantages of e-learning can help you decide whether this is for you or not.
- The authenticity of a particular student's work is also a problem as online just about anyone can do a project rather than the actual student itself.

## Existing Systems

### International University of East Africa Online-U

The International University of East Africa (IUEA) is a private University licensed by the Uganda National Council for Higher Education (NCHE) Our multicultural environment consists of a student body and staff who bring on board various experiences and dynamism to the institution. It has the best e-learning platform in the country. Their system is to provide their students with insights, and tools to create and enhance a collaborative and meaningful online learning environment for a quality educational experience. It is software for e-learning and powered by mElimu. The platform works across multiple devices including tablets and laptops. mElimu's revolutionary digital learning platform allows students to learn anywhere, anytime, at their convenience. The system allows you to:

- It has video recording for facial identification utilizing artificial intelligence to ensure that the right student is taking his or her exams.
- Real-time grading after assessment.
- Allows student to track their progress which is currently in beta.
- E-library is available.
- Students' discussion forum is available.
- It allows the student to access videos, pdf, and PowerPoints.
- It's mobile responsive which does not demand every student to have a tablet or a PC for a better learning experience.
- Online student feedback is available
- Students interact with lectures.
- The user interface of the system is well designed, and the user experience is up to standard.
- It allows students to manage their schedule in real-time
- It has online examinations for testing students.



### Cavendish University Uganda Claned Platform

Cavendish University has developed a comprehensive student-friendly learning platform, which is well-equipped to make studying more accessible and convenient for students. It is safe to claim that the platform established and administered by "CLANED" is among the best E-Learning platforms among Ugandan Universities today, having been created with the latest instruments of the present period in the internet world.

The system allows you to:

- **Social learning** The Claned online learning platform encourages learners to collaborate and interact. In a similar way to using social media, course participants can post comments, discuss issues, and share notes. Studies have shown that learning together increases motivation and promotes better result
- **Track learning in real time: Claned** has a track view that lets teachers easily follow their learners' progress. With one click, you can see what materials each learner has completed, how much time they have spent on the course, and what materials they might be struggling with. This lets you help the learners who need it and prevent dropout
- **Learning analytics:** Claned automatically collects data from every interaction that happens in the online learning platform. The data has many uses from identifying learners at risk of dropping out to improving specific areas of your courses.
- Includes repository, invited boards, boards, chat boards, notification, and settings.
- Course overview, content, track, modules, and analytics.
- Student learning outcome.

### Makerere University E-Learning Environment

The eLearning Centre started as a project in 2013 and was formalized as a Centre in 2016. The intention was to provide effective integration of appropriate technologies and services to strengthen and enhance the teaching and learning missions of the school, on-campus, between campuses, and online. Now, the Centre has over 40,000 registered users including staff and students. The Centre has over 58 courses taught through blended learning. The system allows you to:

- Online testing and grading immediately after the assessment.
- It allows the student to access videos, pdf, and PowerPoints.
- It's mobile responsive which does not demand every student to have a tablet or a PC for a better learning experience.
- Online student feedback is available
- It allows students to manage their schedule in real-time



- Students' grades are available
- A calendar with upcoming events is available
- It has online examinations for testing students.
- Admin and teacher's dashboard.

**Table 1: Comparison of the existing system to the proposed system.**

CHARACTERISTICS	IUEA ONLINE U	CAVENDISH CLANED	MAKERERE E- LEARNING	AI- DRIVEN CLEARANCE SYSTEM MODULE
Responsiveness	Yes	Yes	Yes	Yes
Student's feedback	Yes	Yes	Yes	Yes
AI- Driven Clearance Module for Examinations	No	No	No	Yes
Learning analytics	No	Yes	No	Yes

## Conclusion

Based on all the above literature, this proposed system is a part of the existing system that focuses on clearing students to sit for the examination which decision is based on the learning analytics collected when the student is enrolled in the system. Iuea's, Makerere's, and Cavendish's existing systems have nearly identical functionality, but Cavendish offers learning analytics, which none of the other systems have implemented. All the systems, however, lack the Examinations Clearance Module, which recommends students with an outstanding balance in the final year, and final semester to sit final exams to increase the number of graduates.

## METHODOLOGY

### System Study

The current E-Learning system was analyzed for the project team to understand and gather requirements for the new module to be added to the system. The system was investigated by interacting with some of the organization's employees and asking them a series of informal questions to gain a better idea of how the entire process from enrollment to exams, was carried out in general. The interview data were recorded and then transcribed to produce text that was analyzed using quantitative and qualitative methods of data analysis. Furthermore, a questionnaire was developed with a series of questions where the users responded positively the questions using a pencil and paper. Using the observational technique, we learned about the sensitive issues that the participants in the existing system were unwilling to talk about. We acquired contextual information for evaluation and to make sense of the data collected using other techniques. The data collected was analyzed using both structured and non-structured





analysis approaches. Using the above techniques, we were able to understand the existing system and to gain the user's opinions about the existing and the new module system.

### Existing System

IUEA OnlineU system is currently built on top of Moodle an online Learning Management system enabling educators to create their private website filled with dynamic courses that extend learning, anytime, anywhere but lacking an AI-driven Exam Clearance System module to recommend a measure where a student can sit for their final year semester exams even when they have not yet cleared tuition fees of their final year 2<sup>nd</sup> semester of their program of study using students' payment history data the can be used by the Dean's Offices, Guild's Office and the Academic Registrar's Office. Currently, for a student to be allowed to take exams with an outstanding balance, he or she must write a letter to the dean's office explaining why they're unable to pay. The letter will then be read by the Dean of their faculty, who will examine if they have attended 75 percent of their classes on the OnlineU platform or in person. After that, the dean will go to the account's office and appeal that for the student to sit for exams. The account's officer, firstly, must examine the students' payment history to verify if they have paid up to year 3 semester 1 and have had a reasonable payment record. Secondly, if the student has satisfied the payment to the above level and has had a considerable payment record with attendance above 75%, recommended on an agreement to sit for final exams.

Based on the above procedure, there were a lot of inconveniences and time wastage incurred in the process of making an application to sit for exams. It was even worse for those who study online.

## DATA ANALYSIS RESULTS

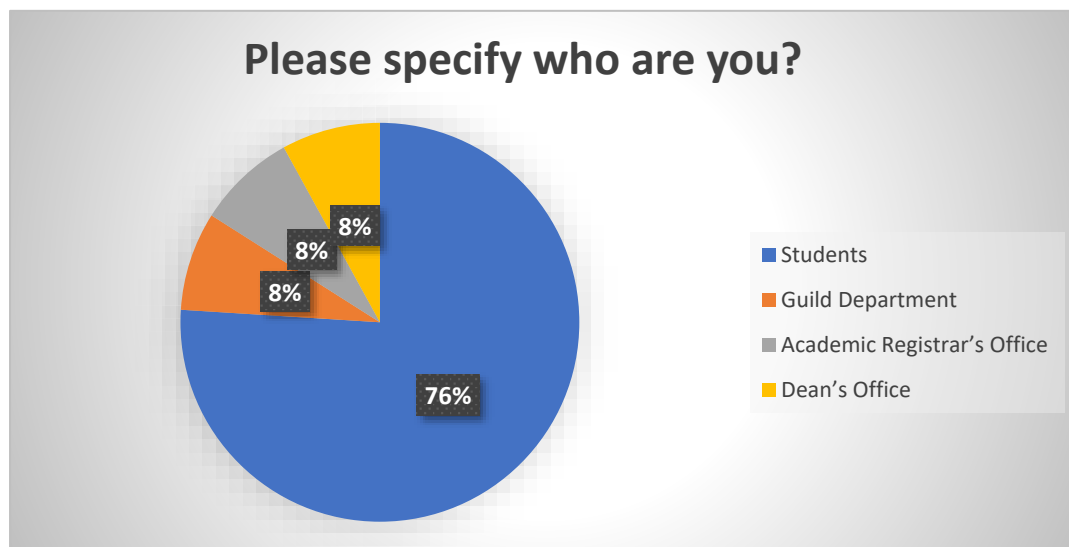
The techniques used for data collection were questionnaires, observation, and interviews. After data collection, we analyzed the data from the survey to obtain accurate information about the existing and the new system.

### Questionnaires

Due to the distance between the project team and the system users, a questionnaire form was developed with a series of questions and filled by the respondents accordingly. We managed to meet some stakeholders physically and they were also able to respond to the questionnaires. Only 20 stakeholders responded positively. The pie charts below show the responses from the users of the system. Statistics and deductions generated from the responses to each question were also shown in tabular form below:

**Table 2: Question 1. Please specify who are you?**

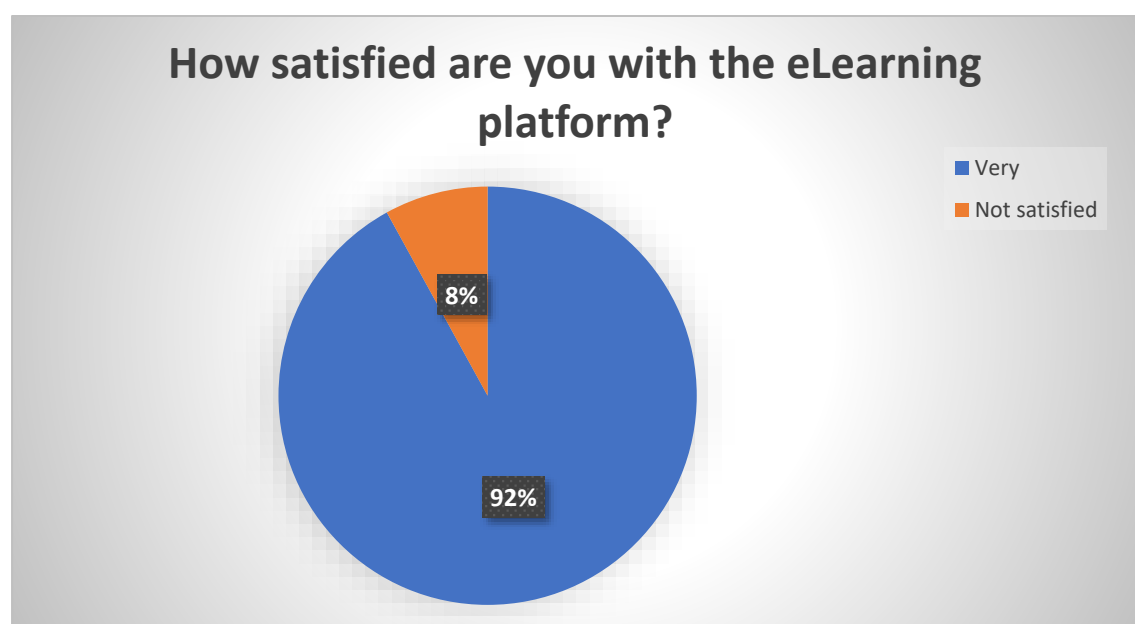
Personnel	Number of personnel	Percentage
Students	19	76%
Guild Department	2	8%
Academic Registrar's Office	2	8%
Dean's Office	2	8%
Total	25	100%



**Figure 1: Please specify who you are?**

**Table 3: Question 2. How satisfied are you with the eLearning platform?**

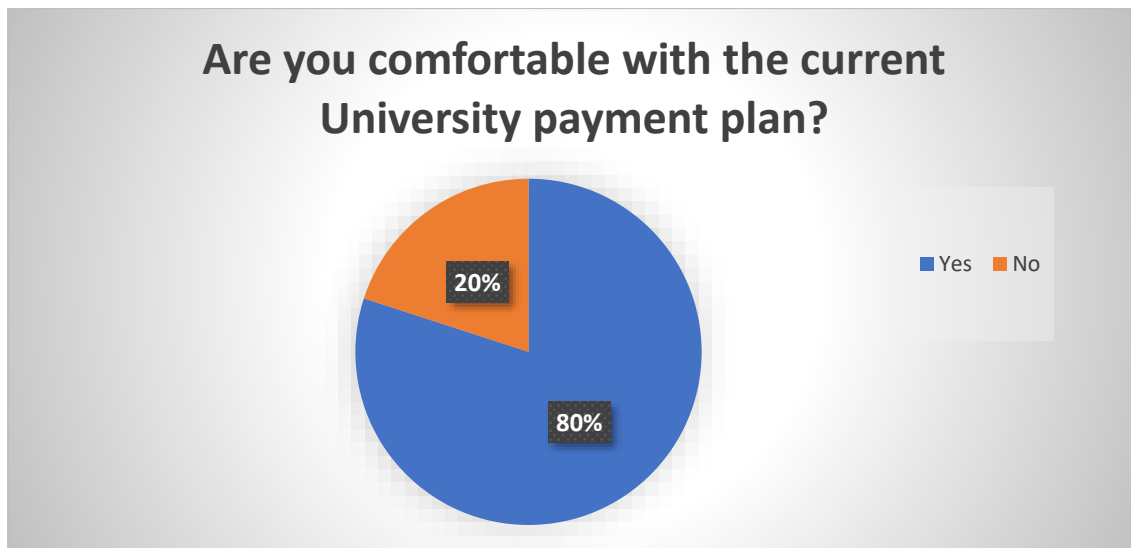
	Number of Personnel	Percentage
Very	23	92%
Not satisfied	2	8%
Total	25	100%



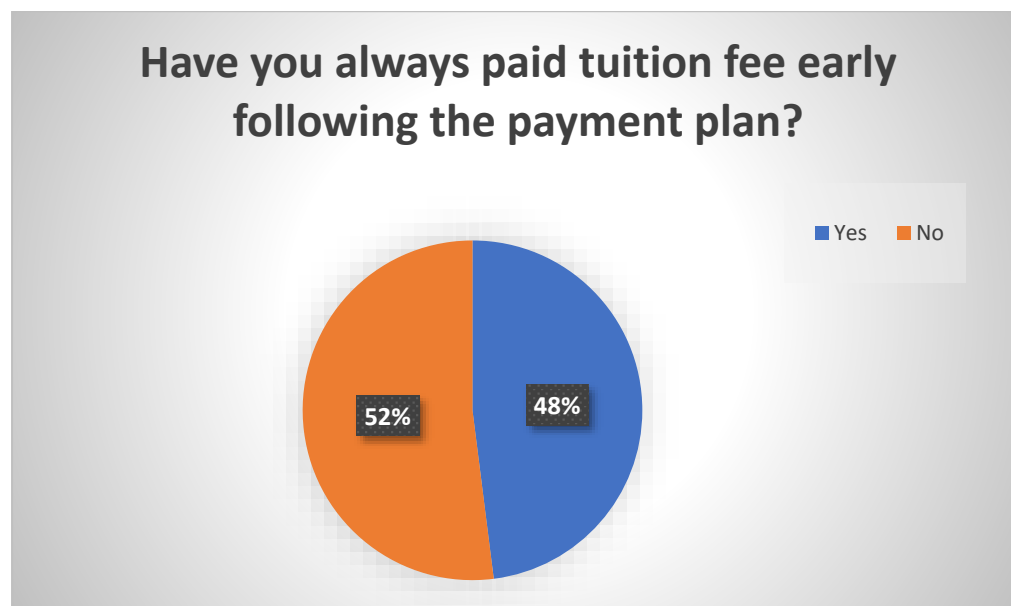
**Figure 2: How Satisfied are you with eLearning?**

**Table 4: Question 4. Are you comfortable with the current University payment plan?**

	Number of personnel	Percentage
Yes	20	80%
No	5	20%
Total	25	100%

**Figure 3: Are you comfortable with the current University Payment Plan?****Table 5: Question 5. Have you always paid tuition fees early following the payment plan?**

	Number of personnel	Percentage
Yes	12	48%
No	13	52%
Total	25	100%



**Figure 4: Have you always paid tuition fees early following the payment plan?**

**Table 6: Question 6. Have you paid any penalty for late payment?**

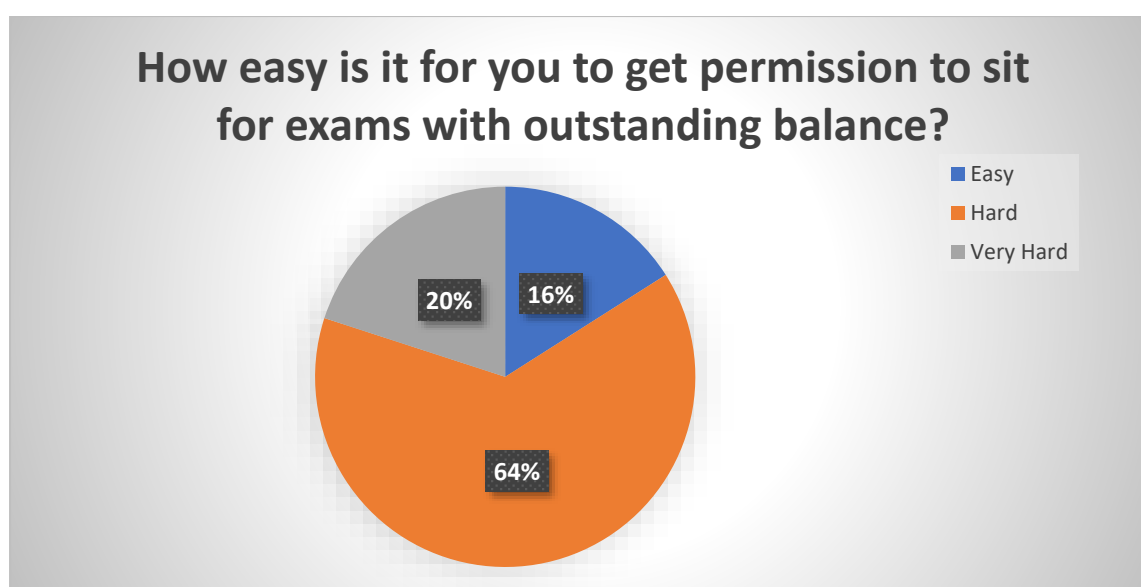
	Number of personnel	Percentage
Yes	14	56%
No	11	44%
Total	25	100%



**Figure 5: Have you paid any penalty for late payment?**

**Table 7: Question 7. How easy is it for you to get permission to sit for exams with outstanding balance?**

	Number of personnel	Percentage
Easy	4	16%
Hard	16	64%
Very Hard	5	20%
Total	25	100%



**Figure 6: How easy is it for you to get permission to sit for exams with outstanding balance?**

## Interviews

The interview technique was used to gain more information about the existing system being used in

health facilities, and to achieve requirements for the new system. During the interview, major stakeholders were interviewed face to face from the students to the quality insurance officer and other staff of the university. An interview guide was planned and used which involved the set of questions that were asked like those in the questionnaires and respondents gave answers based on their experience and personal understanding of the existing system. All the answers from the respondents were recorded and analyzed for further understanding of the existing system. Below are the findings of the interview:



Questions	Answer 1 (Student)	Answer 3 (Dean's Office)	Conclusion
1, How easy is it to get clearance for the exam as a student with outstanding payment.	It's not easy at all because sometimes you don't get attended to on time and we have to come back the next day.	It depends on the number of students with outstanding fees and also how fast we can get records from the accounting department.	Currently clearing students with outstanding fees for the exam is not efficient due to certain factors.
2. Does the current school payment plan affects your academic performance.	Yes, it does because sometimes one can miss exams because of late clearance.	Yes, it does because sometimes we do not get to clear all students in a day, and some have to come back again.	The current system is not flexible, it hinders the academic performance of most students.

### Strengths of the current system.

- The existing system has proven to be very scalable; the number of students is not limited to the classroom.
- The current system doesn't need an internet connection, a daily fee of internet subscriptions with the internet service provider (ISP), or an area supporting internet service to write an appeal to be permitted to sit for exams.
- The current system doesn't require the purchase of hardware or subscriptions to software for system updates or upgrades of the operating system to be permitted to sit exams with an outstanding balance.
- Every interaction that takes place in the online learning platform is automatically recorded by the systems. The data can be used for a variety of purposes, including identifying students who are in danger of dropping out, strengthening certain aspects of your courses, and providing useful analytical data.





## **Weaknesses**

The weaknesses of the existing system are as follows:

- The existing systems keep track of letters from students seeking permission to sit exams on papers, which makes it impossible to keep track of and manage.
- Students who study online must travel a long distance and go through a hectic process of waiting just to do something as simple as asking for permission to sit for exams with an outstanding balance.
- Labor-intensive. The existing system requires a lot of physical interactions making it time-consuming and prone to a lot of students' disappointment.

## **System Analysis**

Based on the outcomes from the system study, the functional and non-functional requirements of the AI Driven Exams Clearance system were evaluated as follows:

### **User Requirements**

This includes statements to determine several requirements and the functionalities under different constraints that the AI Driven Exams Clearance system should provide, according to the user's requirements.

From the system study, some actors were identified. These are as follows.

- The system should be user-friendly and easy to use by novice users.
- The system should provide a fast response time.
- The system should ensure that each beneficiary receives the available aid.

### **Functional Requirements**

These include the services that the developed system must provide to the entire system users or the internal working nature of the system.

#### **System administrator**

- The system should allow the administrator to view all administrator and user details.
- The system should allow the administrator to edit administrator and users' details.
- The system should allow the administrator to view reports provided by the account manager.
- The system should allow the administrator to analyze students' details about their payments.



- The system should allow the administrator to enable a student who meets the criterion to sit for an exam.

#### **Account manager**

- The system should allow the account manager to enter student data.
- The system should allow the account manager to provide a report about student payments.

#### **Students**

- The system should allow the student to make permission online once they're aware of any circumstances that will make them default in payments.
- The system should allow students to be notified when they have been approved.

#### **Non-Functional Requirements**

Some constraints should be imposed on services provided by the developed system. The system was designed to meet the following non-functional requirements.

- **Security**

The subsystem should provide a high level of security and integrity of the data held by the system, only authorized personnel of the company can gain access to the company's secured page on the system and only users with valid passwords and usernames can log in to view user's page.

- **Performance and Response time**

The system should have a high-performance rate when executing the user's input and should be able to provide feedback or response.

- **Error handling**

The error should be considerably minimized and an appropriate error message that guides the user to recover from an error should be provided. Validation of the user's input is highly essential.

- **Availability**

This system should always be available for access 24 hours, 7 days a week. Also, in the occurrence of any major system malfunctioning, the system should be available in 1 to 2 working days, so that the business process is not severely affected.

- **Ease of use**

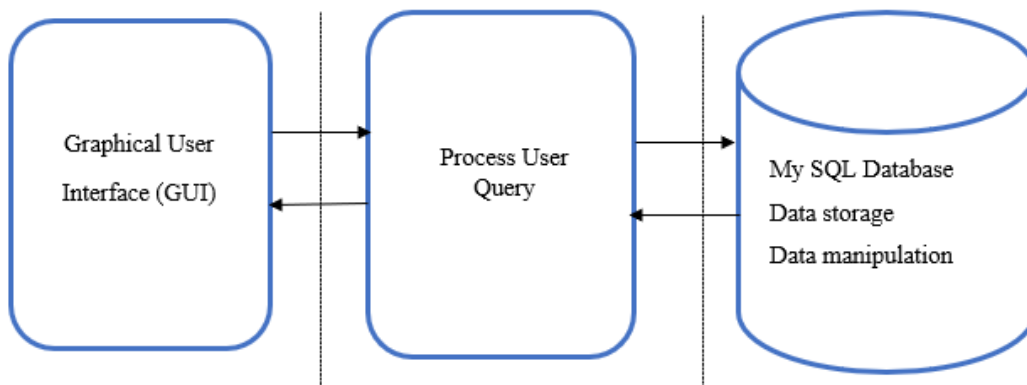
Considering the level of knowledge possessed by the users of this system, a simple but quality user interface should be developed to make it easy to understand and required less training.

## System Design

This section shows how the different functionalities are provided by the different components of the system. Also, this section describes the system design that includes the context diagram, dataflow diagram (DFD), System Architecture, database design, and entity relationship diagram.

### Architectural Design of the System

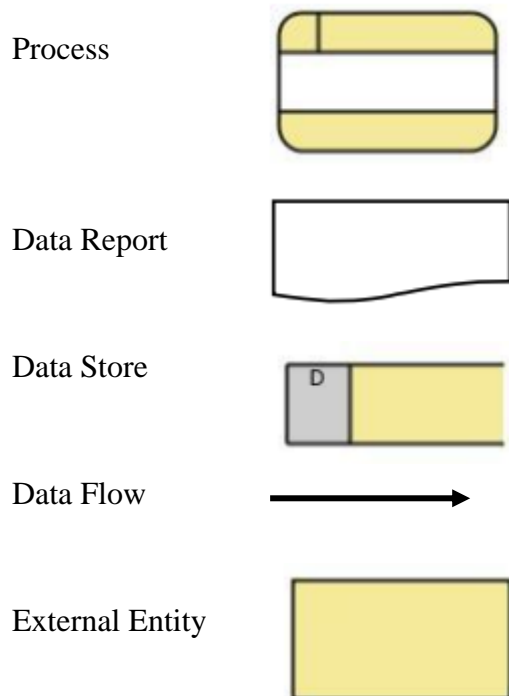
This gives a high-level view of the new system with the main components of the system and the services they provide and how they communicate. The system was implemented using a three-tier architecture that comprises a user interface, process management, and database as illustrated below. This structure ensures that users' interaction with the system was independent of storage consideration.



### Process Modeling

In process modeling, the Sequence diagram was used to model the flow of logic within the proposed system in a visual manner. It shows the major sub-processes identified in the Poultry Management information system. Data obtained from the Data Flow Diagram (DFD), were collectively used to produce the Data Dictionary (DD) of the system.

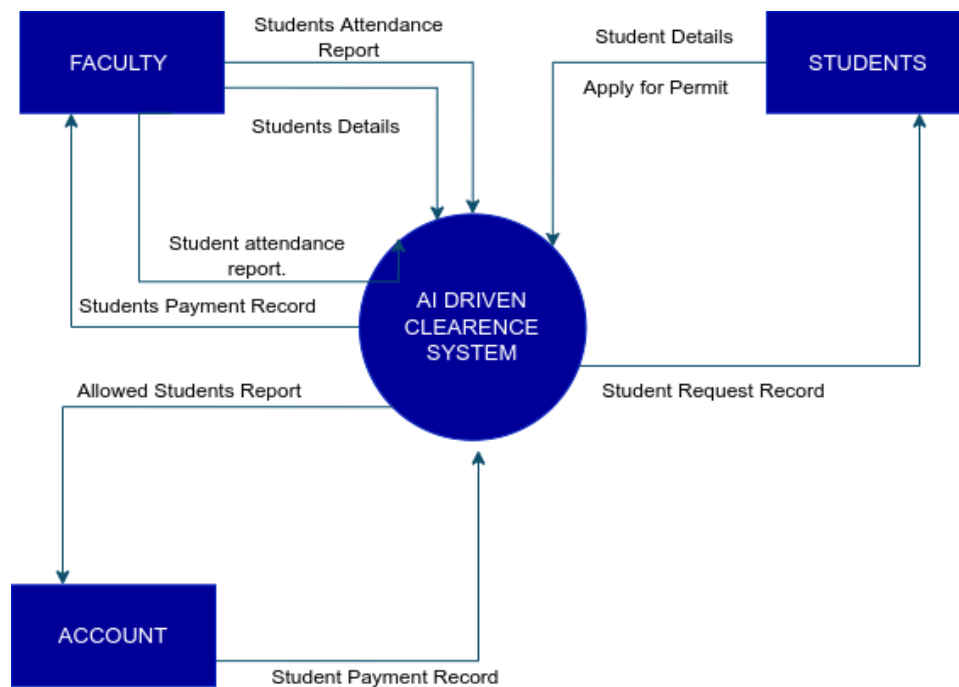
## Key Symbols Used in Process Modeling



### b.) Contextual Diagram

Context flow diagram: This diagram was used to model the AI- DRIVEN CLEARANCE SYSTEM at an abstract level.

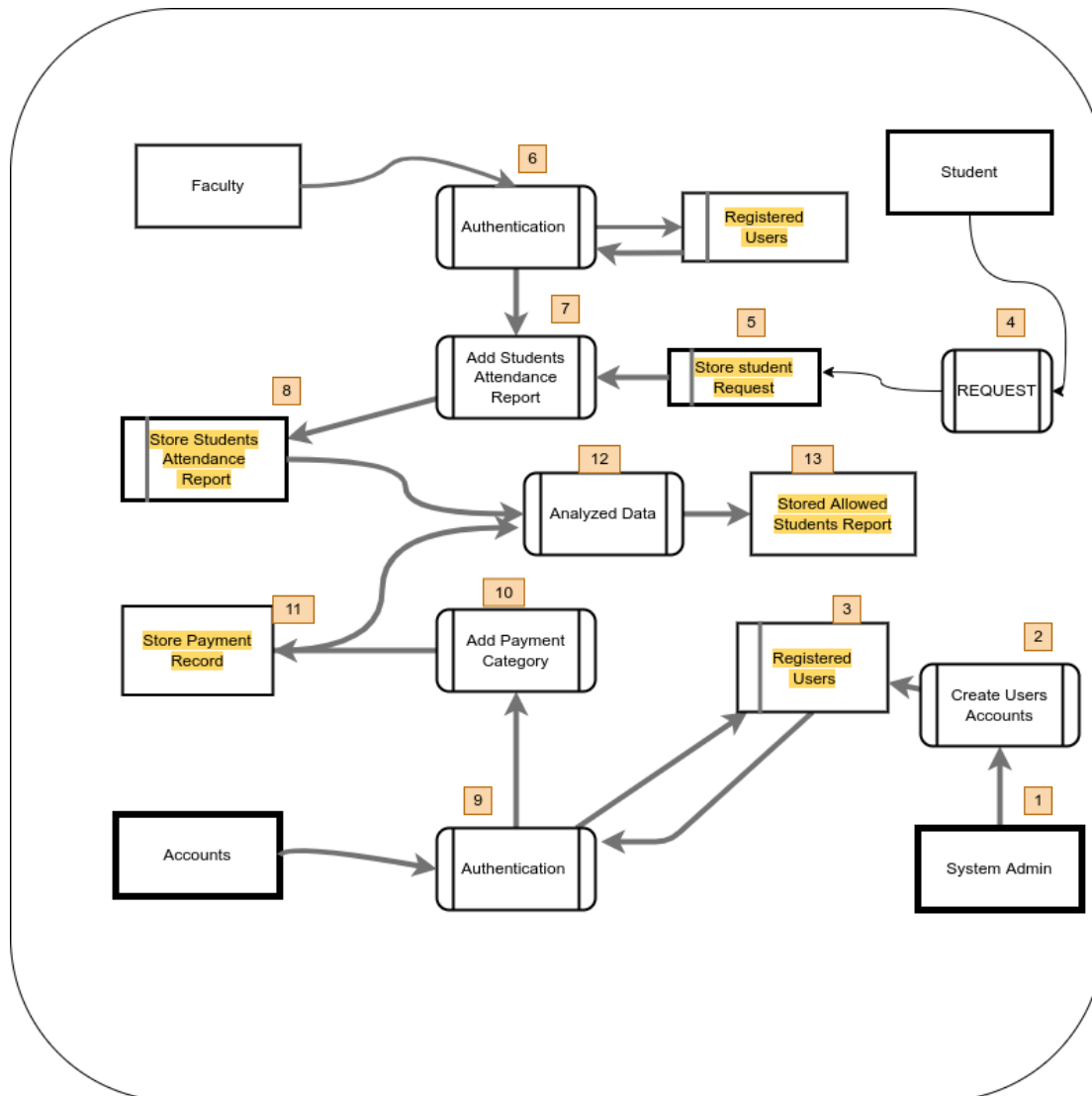
- The context diagram shows the interaction of the system with its environment in terms of data flows
- The context diagram defines the boundary of the system (the scope of the system)
- Only the data flows which leave the system and the data flow which comes from outside the system.



**Figure 7: System Architecture**

### Level 1 Data Flow Diagram

Data flow diagrams model the flow of data into, through, and out of an information system; show the processes that change or transform data, show the movement of data between processes, and represent a system as a network of processes that transform data flowing between them.



**Figure 8: Data flow diagram for AI-driven exam clearance system**

Entity Name	Description
System Admin	Super system user who can configure the system. Register staff, deny unauthorized users, and manage records.
Student	The system user is the primary user and basic benefit of the system. The student requested clearance and awaits confirmation.
Account Manager	Views payment records, perform checks, and clears student for exams.



**Table 9: Dictionary for the level 1 data flow diagram**

Process	Description
View, approve, reject	The activity of viewing requests, approving requests and rejecting requests.
View of rejected, approved request	The activity of viewing rejected requests and viewing approved requests.
Adding of request	The activity of adding new request
Generating of request report	The activity of generating requests
Requesting of Clearance	The activity of requesting clearance
View, delete, update student Update, view staff	The activity of updating, viewing, and deleting student and staff records.
Add new, delete, update, view student request	The activity of adding new student requests, updating student requests, and viewing and deleting the request.
Submission of validation	The activity of submitting validation is done after completing checks.

**Table 10: Data dictionary for Data**

Data Store	Description
User Details	Stores information about the details of Users
Request Details	Stores information about the request's details
Sent Request	Stores information about the requests sent
Student Details	Stores information about the details of student
Admin Details	Stores information about the details of Admin

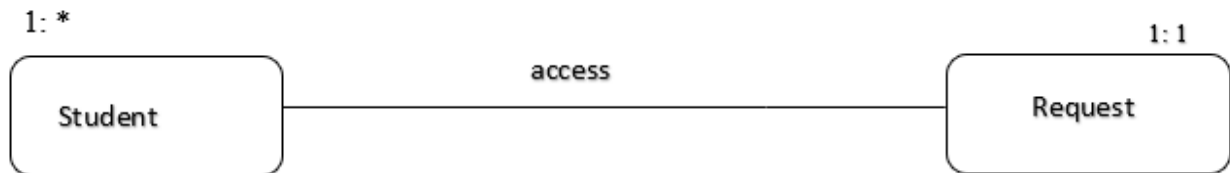
### Modeling of Entity Relationships.

The data modeling of the system was done by ascertaining the data requirements, entities, and their related attributes that make up the system. Modeling of the relationships between the entities was designed with an enriched entity relationship diagram for the system.



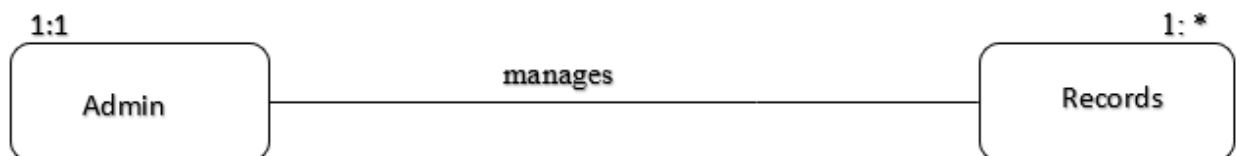
- **Relationship Between Student and Request**

One of many students can have one request



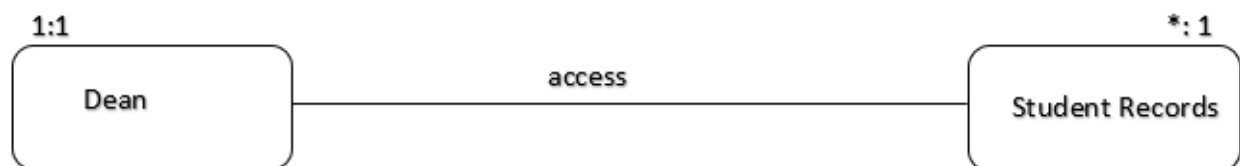
- **Relationship Between Admin and Records**

One Admin can manage one or many records



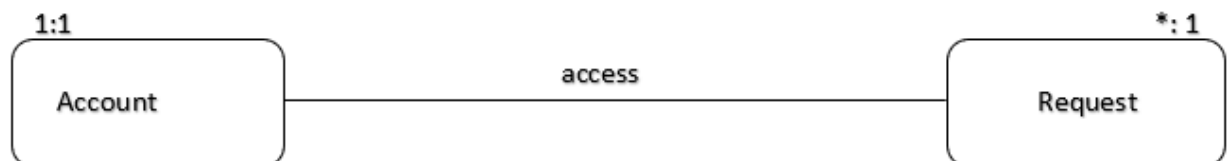
- **Relationship Between Dean and Student Records**

One Dean can have access to many or one student's records



- **Relationship Between Account and Request**

One Account can have access to many or one request



- **Relationship Between Account and Financial Record**

One Account can manage many or one financial record



## Entity Relationship Diagrams (ERDs)

The ERD presented below depicted the entities, some of their attributes, and the relationships between them as it was presented individually above. The diagram further indicates the multiplicities between these entities. Therefore, we decided to include the attributes in the ERD to avoid presenting an outrageous diagram.

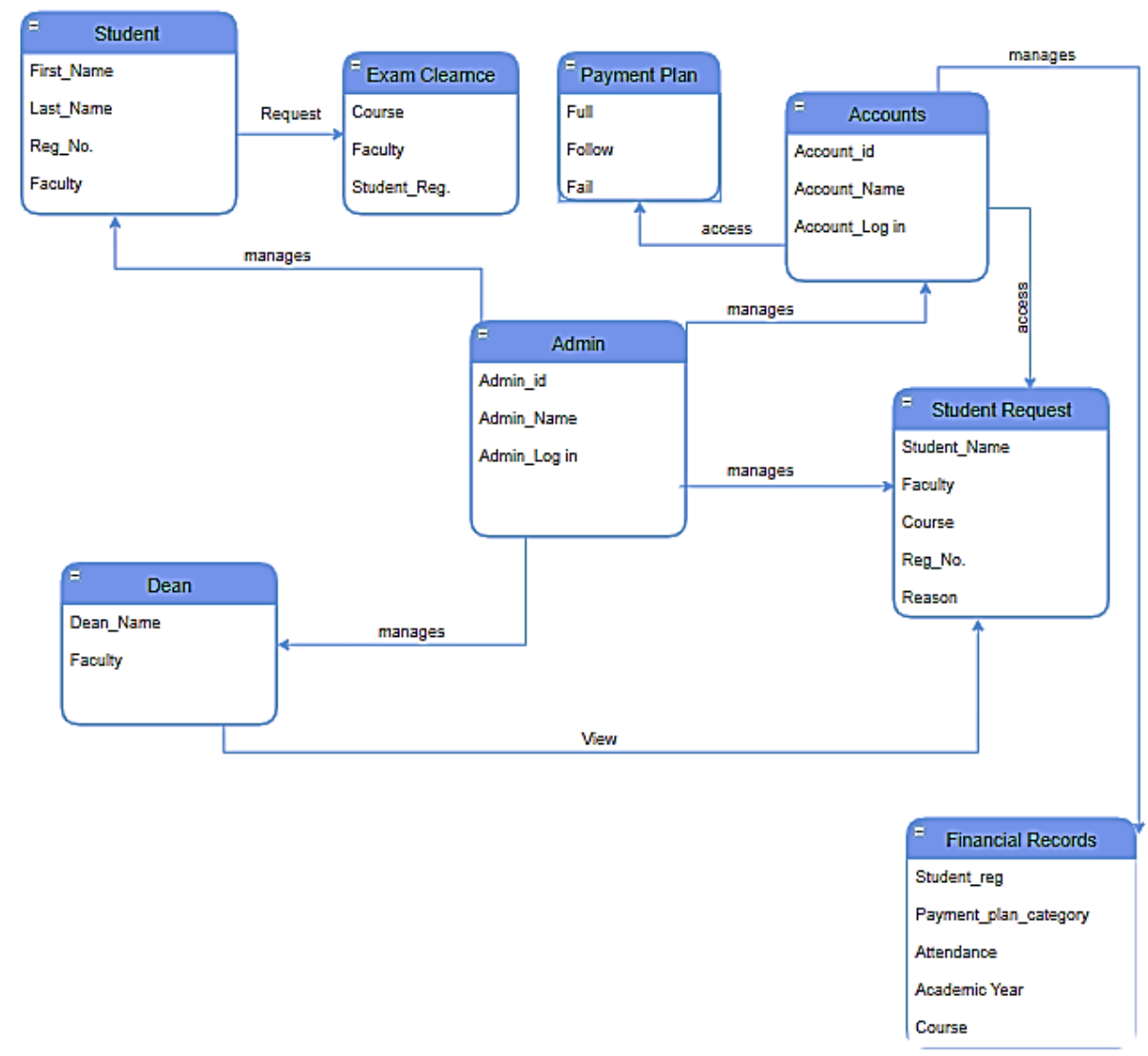


Figure 9: ERD of AI-driven exams clearance system



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## **SYSTEM IMPLEMENTATION, TESTING, AND VALIDATION.**

### **Introduction**

This chapter discusses the implementation of the process and data design models of the AI-driven clearance system. The system testing and validation are also discussed, and screen shots are displayed to show the interfaces the users interact with when using the system.

### **Functions provided by the System**

The AI-Driven Clearance System provides different functions to its users depending on their roles. The system prompts the users for their usernames and passwords, the users provide their credentials then the system validates the user. After, the user can use the system for various tasks depending on his or her role or group.

### **Functions provided to the Admin.**

The admin or superuser is allowed to add and update every model on the system. They can edit and delete users in the system. The admin can also add financial records of students to be analyzed, view student requests approved or declined, and edit, and delete records.

### **Functions provided to the student.**

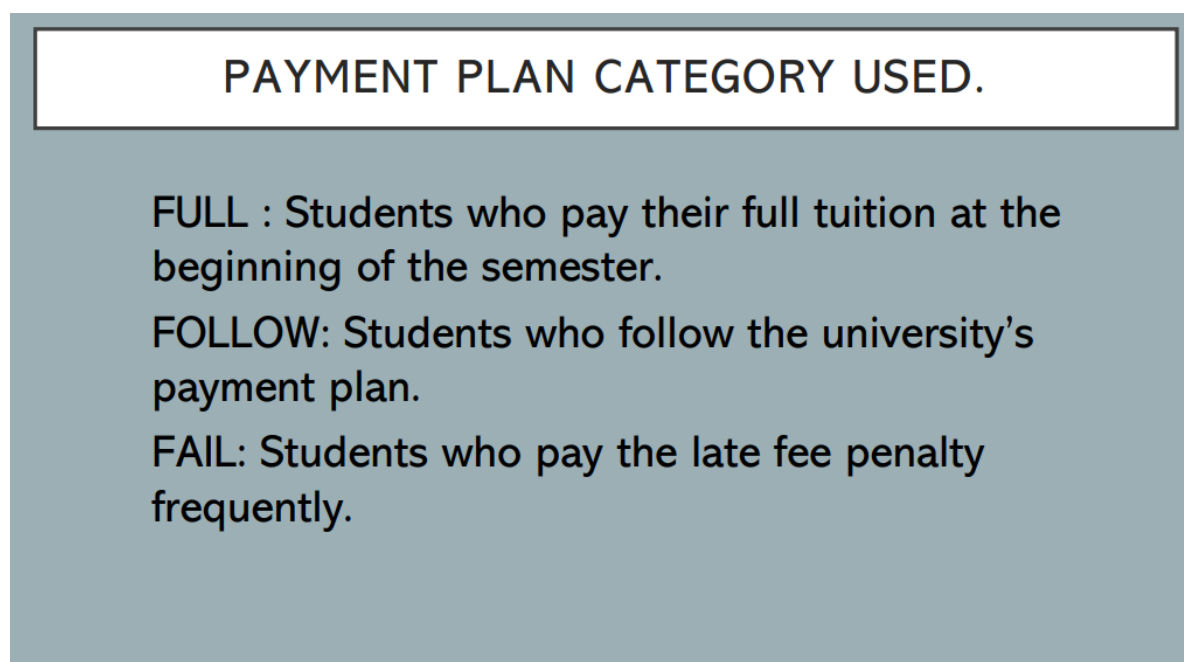
The student can request permission to sit exams when they are not in their final year or final semester. The system automatically recommends students in their final year final semester sit for exams because it is AI-based.

### **Functions provided to the Account Manager.**

The system enables the account manager to add the students' financial records to be analyzed and view students' requests and the recommended students listing as well.

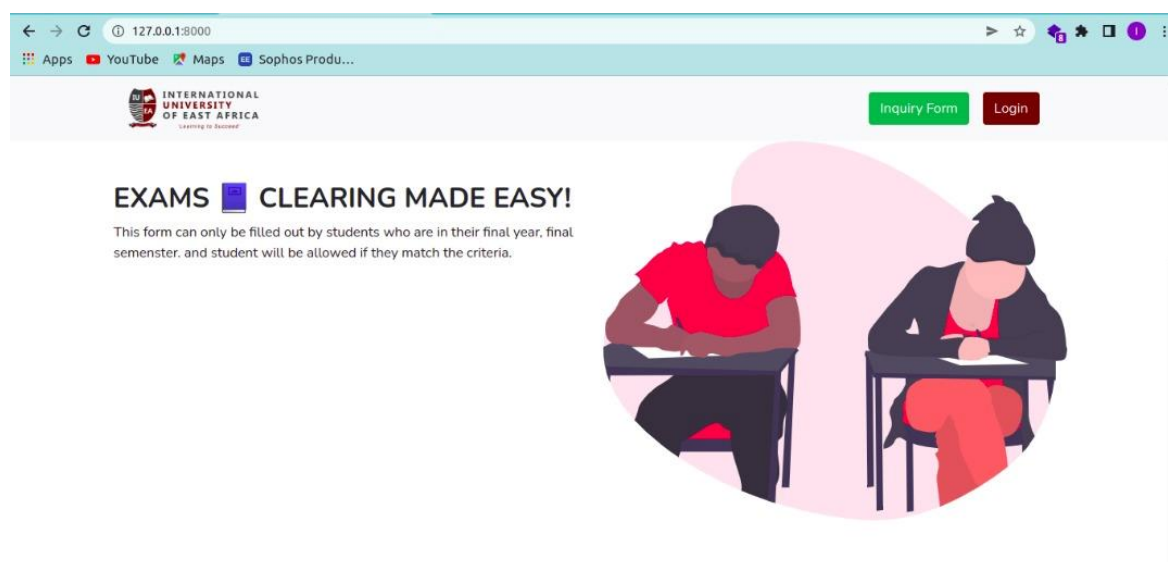
### **Functions provided to the Faculty Dean.**

The system enables the dean to view the analytics of the students, view students request students', and see recommended students listing as well.



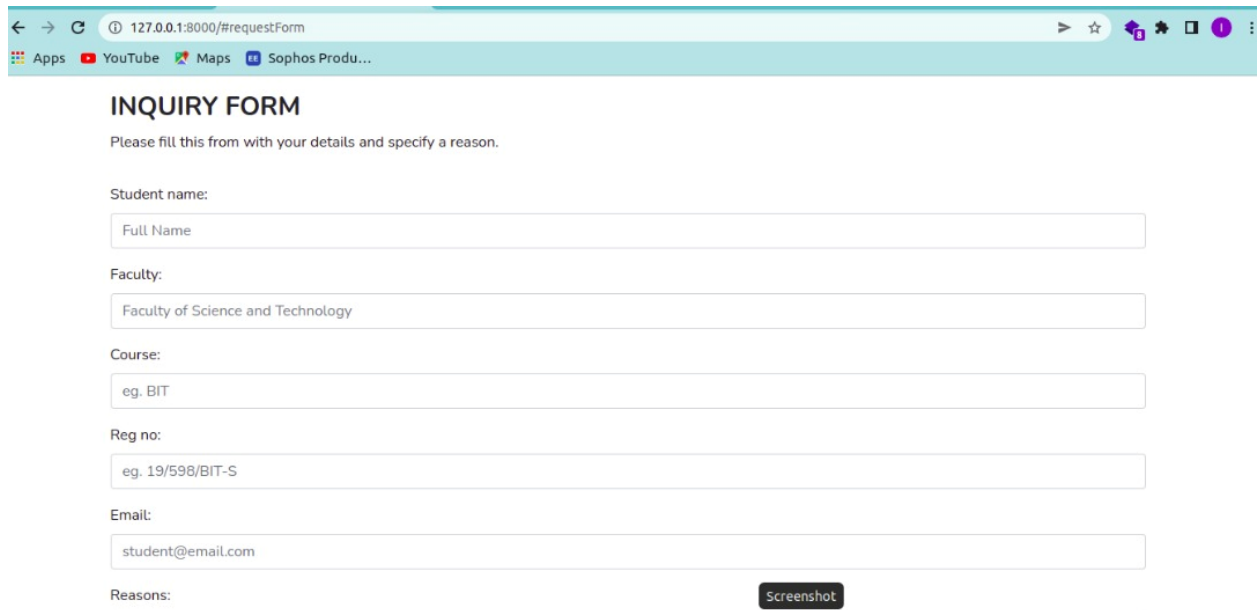
**Figure 10: Sample Screenshots of The Design and Developed System.**

The above is the payment category that every student falls into and therefore must be clarified.



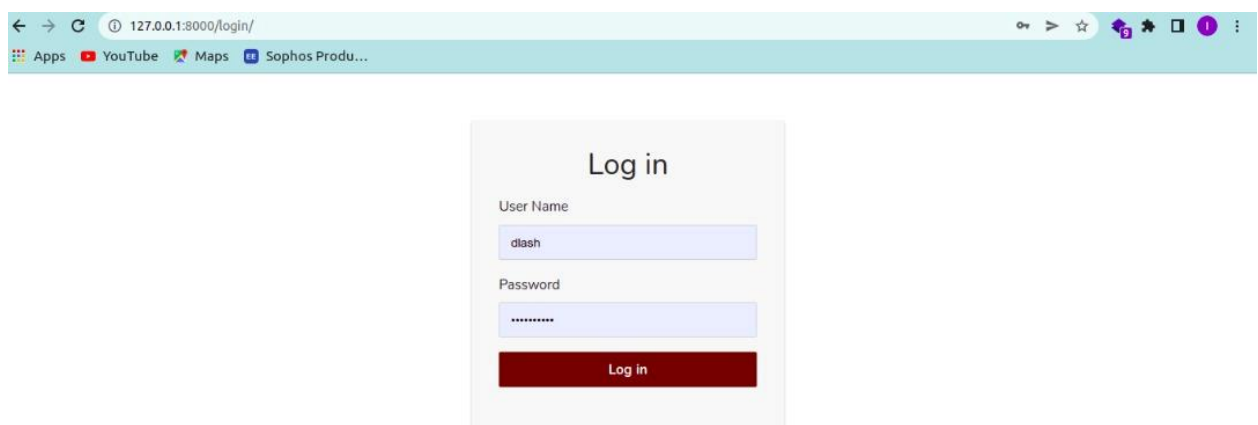
**Figure 11: Landing Page**

The above is the landing page where a user can easily navigate through the navigation bar that contains the Inquiry Form and log in. From here, a user can directly inquire by clicking on the make an inquiry form button in the navigation bar, and the admin, dean, or account officer can log in.



The screenshot shows a web browser window with the address bar displaying "127.0.0.1:8000/#requestForm". The page title is "INQUIRY FORM". Below the title, there is a instruction: "Please fill this form with your details and specify a reason." The form contains several input fields: "Student name:" with a sub-label "Full Name", "Faculty:" with the value "Faculty of Science and Technology", "Course:" with the value "eg. BIT", "Reg no:" with the value "eg. 19/598/BIT-S", and "Email:" with the value "student@email.com". At the bottom, there is a "Reasons:" label and a "Screenshot" button.

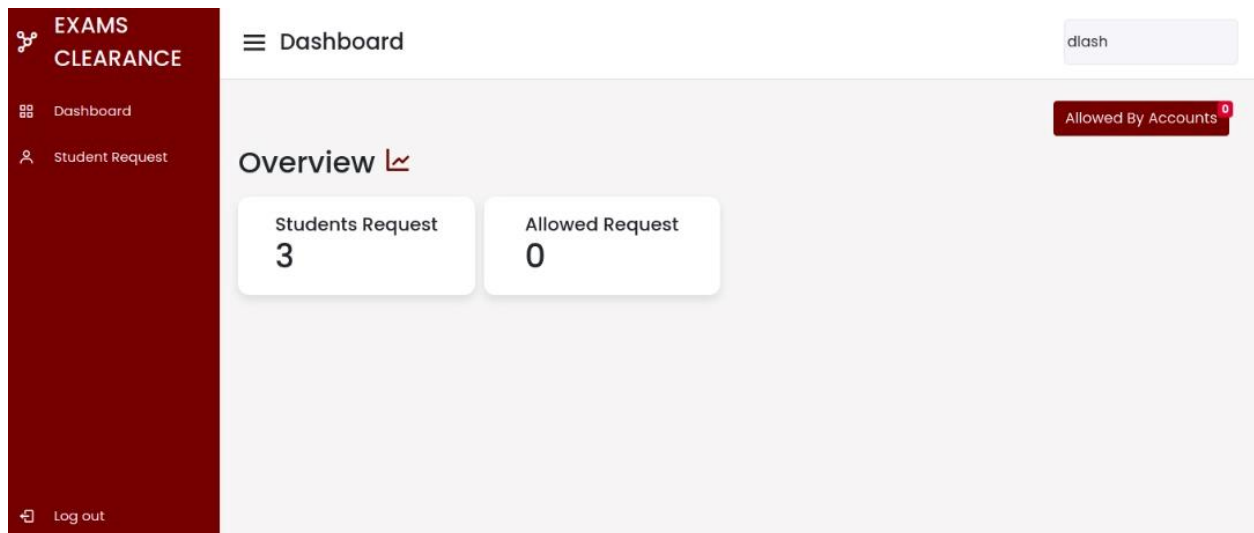
**Figure 12: Showing a page for students' inquiry form.**



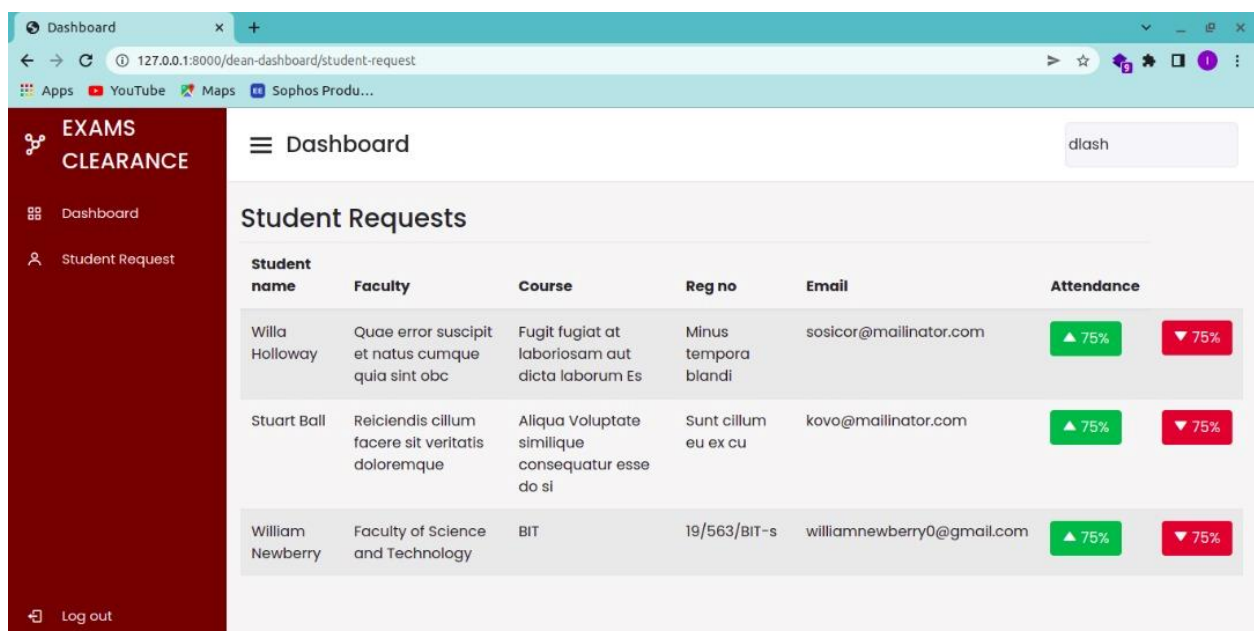
The screenshot shows a web browser window with the address bar displaying "127.0.0.1:8000/login/". The page title is "Log in". Below the title, there are two input fields: "User Name" with the value "dash" and "Password" with the value "\*\*\*\*\*". At the bottom, there is a red "Log in" button.

**Figure 13: Login and Authentication of the different users.**



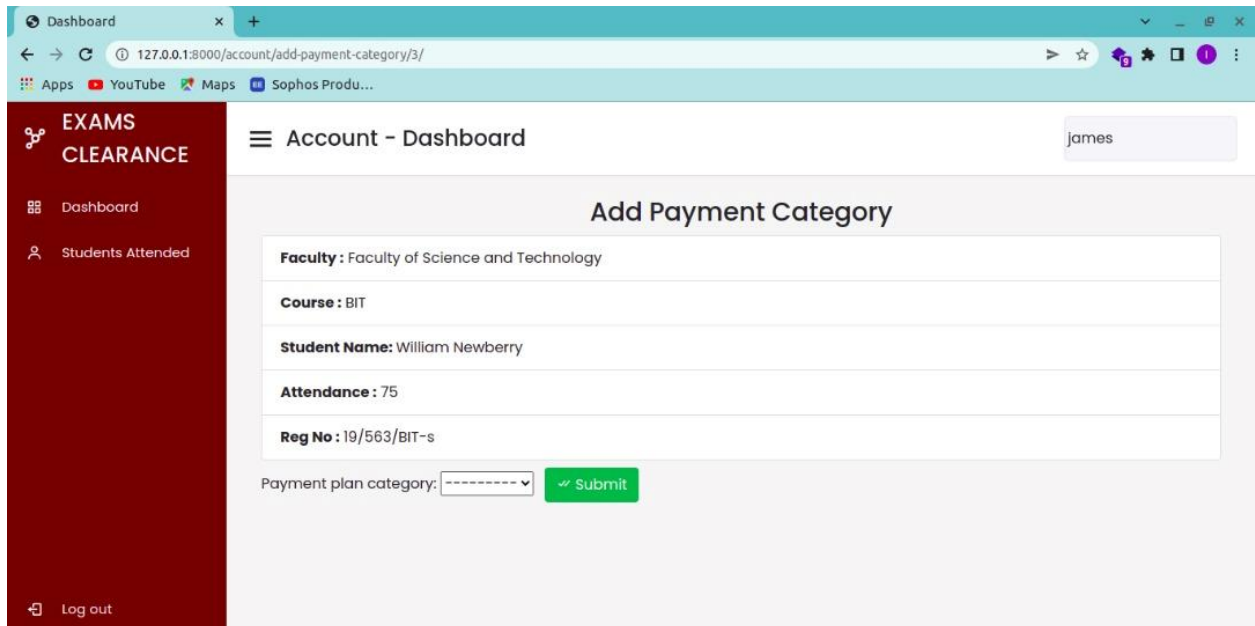


**Figure 14: Dean dashboard is where the dean can see all the students who have placed an inquiry.**



**Figure 15: The student inquiry inquiries or student request page.**

From here the dean can add and generate attendance gotten from the current system of the student.



Dashboard

127.0.0.1:8000/account/add-payment-category/3/

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**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard

james

### Add Payment Category

**Faculty :** Faculty of Science and Technology

**Course :** BIT

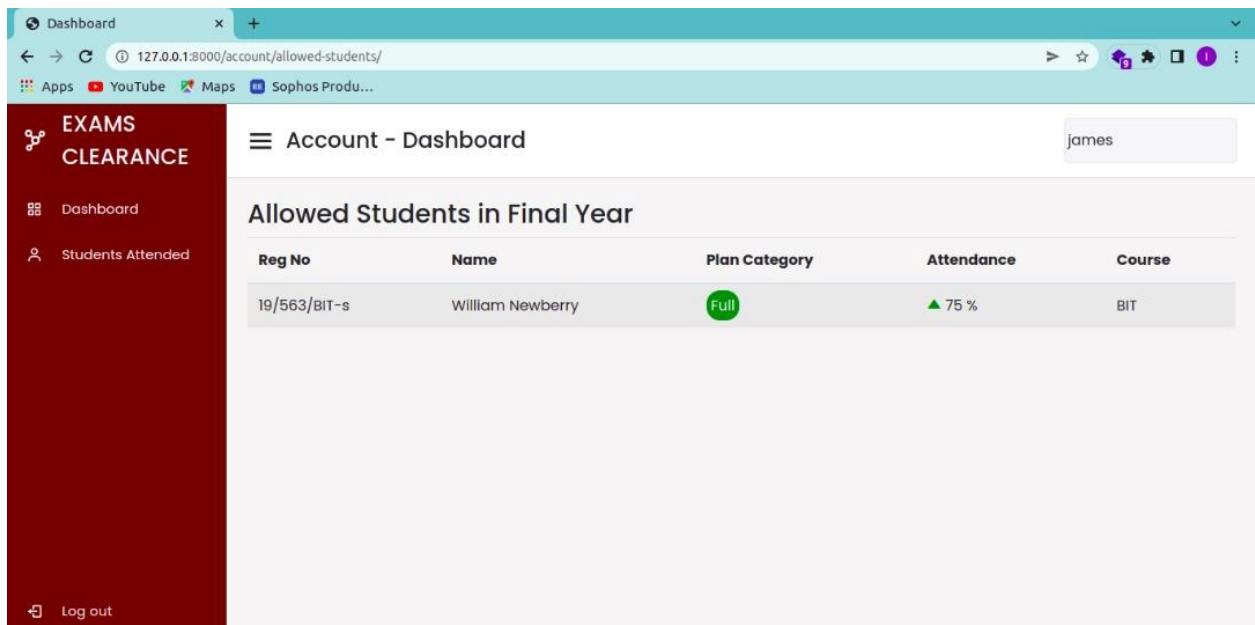
**Student Name:** William Newberry

**Attendance :** 75

**Reg No :** 19/563/BIT-s

Payment plan category:

**Figure 16:**Account dashboard where they can add the payment category of students with 75% attendance only.



Dashboard

127.0.0.1:8000/account/allowed-students/

Apps YouTube Maps Sophos Produ...

**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard

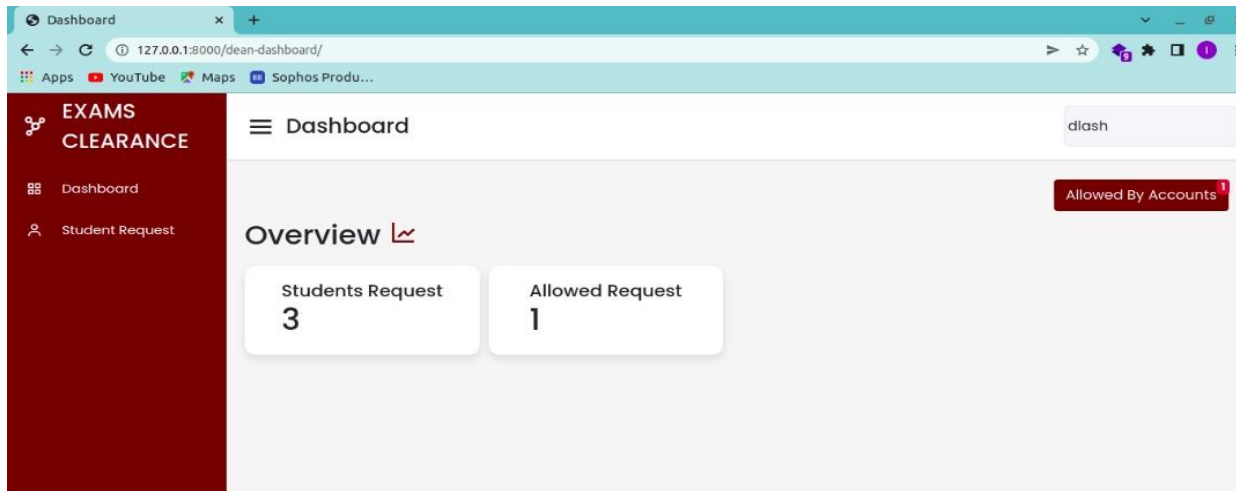
james

### Allowed Students in Final Year

Reg No	Name	Plan Category	Attendance	Course
19/563/BIT-s	William Newberry	Full	▲ 75 %	BIT

**Figure 17:** The account dashboard where they can see the student permitted to sit for exams.

That means they have met the criterion above 75% and fall in the Full or Follow category.



**Figure 18: The dean sees the students allow by the accounts department.**

### System Testing and Validation Results

AI Driven Clearance system was tested using unit, integration, and system testing techniques. After every part of the system was implemented, it was tested using the input to guarantee that each unit responded as expected. After individual units were tested as they were being developed, those whose functionality was associated with others were integrated and also tested using integrated testing. With this, the interaction between these units was verified and defects were also corrected. System testing was performed on the complete integrated system to check whether all the specified requirements were met. These three types of testing were done by the project team developers. The user acceptance system was done by the users of the system. In general, the users stated that the system had a clean layout, and was simple and easy to learn. In other words, it was user-friendly. They also commented that it will ease the process of seeking permission.

### CONCLUSION AND RECOMMENDATIONS

In conclusion, eLearning has developed itself into a useful and powerful tool that can be used in both the academic and corporate world. To assist students to sit for their final year semester exams even when they have not yet cleared tuition fees of the final year 2<sup>nd</sup> semester of their program of study using students' payment history data based on information that we collected, we have developed an AI- DRIVEN EXAMS CLEARANCE SYSTEM module to be added to the current eLearning system.



## Recommendations

### Staff training

We recommend training the staff on how to use the system and training also students on how to use the system.

### Recommendation to the University

The university should implement the AI-DRIVEN CLEARANCE SYSTEM without telling students the purpose of the system to avoid students who have money on hand to pay for school fees but decide to allocate the money to their wants.

### Future Work

We believe that this system will greatly improve the way students who are in their final year to perform in exams. Overall, it will increase the number of graduated students in Uganda. Unfortunately, due to the inadequate time, some functionalities were not included in the system. The following are:

- Include this module in the existing system
- Ability to add more analytical features and intelligent predictions
- Power the model with real data from both faculties and accounts.

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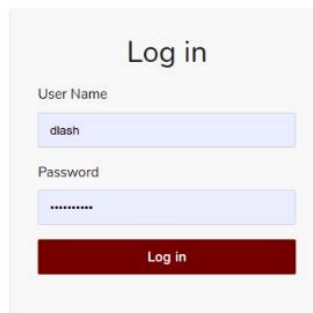
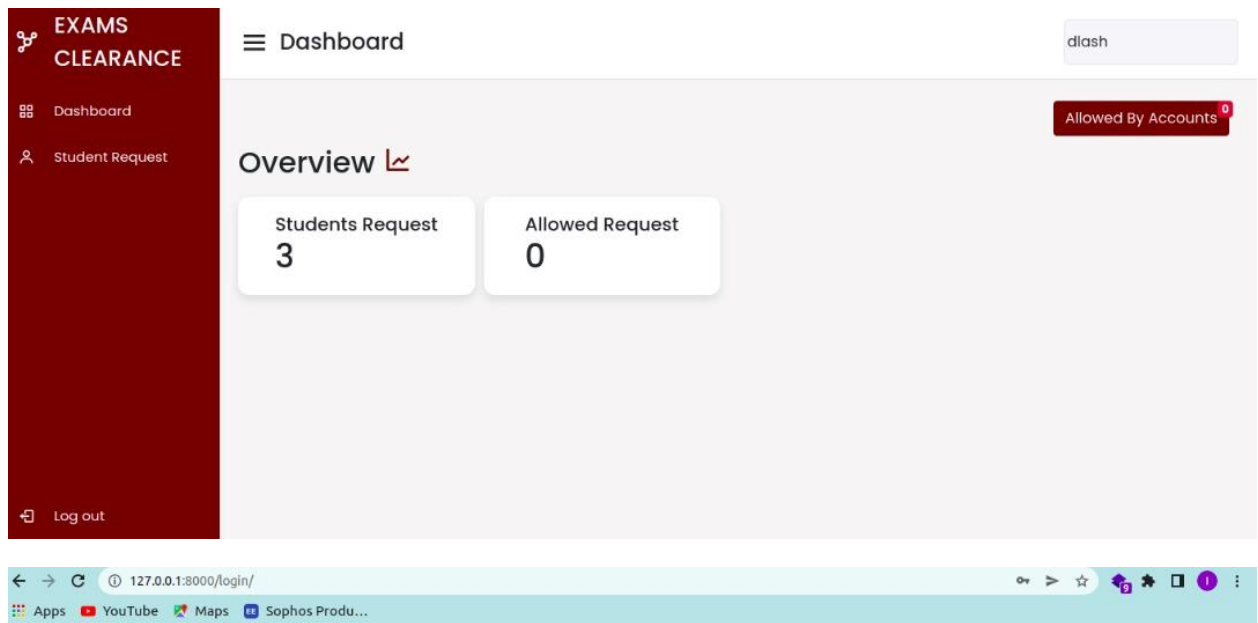
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## APPENDIX

Images Of the System in Design and Implementation Phase.



The image shows a 'Log in' form with a white background and a thin gray border. It contains two input fields: 'User Name' with the text 'dash' and 'Password' with masked characters '\*\*\*\*\*'. A red 'Log in' button is positioned below the password field.





Dashboard

127.0.0.1:8000/dean-dashboard/student-request

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EXAMS CLEARANCE

Dashboard

Student Request

Log out

Dashboard

Student Requests

Student name	Faculty	Course	Reg no	Email	Attendance
Willa Holloway	Quae error suscipit et natus cumque quia sint obc	Fugit fugiat at laboriosam aut dicta laborum Es	Minus tempora blandi	sosicor@mailinator.com	▲ 75% ▼ 75%
Stuart Ball	Reiciendis cillum facere sit veritatis doloremque	Aliqua Voluptate similique consequatur esse do si	Sunt cillum eu ex cu	kovo@mailinator.com	▲ 75% ▼ 75%
William Newberry	Faculty of Science and Technology	BIT	19/563/Bit-s	williamnewberry0@gmail.com	▲ 75% ▼ 75%

Dashboard

127.0.0.1:8000/dean-dashboard/

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EXAMS CLEARANCE

Dashboard

Student Request

Log out

Dashboard

Overview

Allowed By Accounts 1

Students Request 3

Allowed Request 1

Attendance has been added



Dashboard

127.0.0.1:8000/account-dashboard/

Apps YouTube Maps Sophos Produ...

**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard

james

**Overview**

▲ 75% Attendance  
2

▲ Allowed Students  
1

Dashboard

127.0.0.1:8000/account/view-students-attended/

Apps YouTube Maps Sophos Produ...

**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard

james

**Students Attended**

Student name	Faculty	Course	Reg no	Attendance	Actions
Willa Holloway	Quae error suscipit et natus cumque quia sint obc	Fugit fugiat at laboriosam aut dicta laborum Es	Minus tempora blandi	▲ 75 %	+ Payment Category
William Newberry	Faculty of Science and Technology	BIT	19/563/BIT-s	▲ 75 %	+ Payment Category



Dashboard x +

127.0.0.1:8000/account/view-students-attended/

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**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard james

### Students Attended

Student name	Faculty	Course	Reg no	Attendance	Actions
Willa Holloway	Quae error suscipit et natus cumque quia sint obc	Fugit fugiat at laboriosam aut dicta laborum Es	Minus tempora blandi	▲ 75 %	+ Payment Category
William Newberry	Faculty of Science and Technology	BIT	19/563/BIT-s	▲ 75 %	+ Payment Category

Dashboard x +

127.0.0.1:8000/account/add-payment-category/3/

Apps YouTube Maps Sophos Produ...

**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard james

### Add Payment Category

Faculty : Faculty of Science and Technology

Course : BIT

Student Name: William Newberry

Attendance : 75

Reg No : 19/563/BIT-s

Payment plan category:  Submit



Dashboard x +

127.0.0.1:8000/account/allowed-students/

Apps YouTube Maps Sophos Produ...

**EXAMS CLEARANCE**

Dashboard

Students Attended

Log out

Account - Dashboard

james

### Allowed Students in Final Year

Reg No	Name	Plan Category	Attendance	Course
19/563/BIT-s	William Newberry	Full	75 %	BIT

127.0.0.1:8000

Apps YouTube Maps Sophos Produ...

INTERNATIONAL UNIVERSITY OF EAST AFRICA  
Learning to Succeed

Inquiry Form Login

## EXAMS CLEARING MADE EASY!

This form can only be filled out by students who are in their final year, final semester, and student will be allowed if they match the criteria.



← → ↻ 127.0.0.1:8000/#requestForm

Apps YouTube Maps Sophos Produ...

## INQUIRY FORM

Please fill this form with your details and specify a reason.

Student name:

Faculty:

Course:

Reg no:

Email:

Reasons:

## IMAGES OF THE QUESTIONNAIRES

### Final Year Questionnaire

lewisisrael6@gmail.com (not shared) [Switch accounts](#)

1. Please specify who are you?

Your answer

2. On a scale 1-10 how do you rate online learning platform?

1 2 3 4 5 6 7 8 9 10

3. Between Online and physical which is convenient to use base on your vote?

☐ Online

☐ Physical

4. Are you comfortable with the current university payment plan?

☐ Yes

[Request edit access](#)

5. Have you always paid tuition fee early following the payment plan?

☐ Yes

☐ No

6. Have you payed any penalty of late payment?

☐ Yes

☐ No

7. How easy is it for you to get permission to sit for exams with outstanding balance?

☐ Easy

☐ Very Easy

☐ Hard

☐ Very Hard

[Clear form](#)

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Google Forms [Request edit access](#)



## **PAYMENT PLAN CATEGORY USED.**

**FULL :** Students who pay their full tuition at the beginning of the semester.

**FOLLOW:** Students who follow the university's payment plan.

**FAIL:** Students who pay the late fee penalty frequently.