Woldia University

Institute of Technology

School of Computing

Department of Information Technology

Title of Project: Web Based Academic Staff Clearance System for Woldia University

Industrial Project-1

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Declaration

The Project is our own and has not been presented for a degree in any other university and all the sources of material used for the project have been duly acknowledged.

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Faculty: Institute of Technology

School: Computing

Program: Degree of Bachelor of Science in Information Technology

Project Title**:** Web Based Academic Staff Clearance System for Woldia University

This is to certify that I have read this project and that in my supervision and the students' performance, it is fully adequate, in scope and quality, as a project for the degree of Bachelor of Science.

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It is approved that this project has been written in compliance with the formatting rules laid down by the faculty.

Acknowledgment

First and fore most our biggest thanks would be to Almighty God because nothing could be possible without his free will. Secondly, we would like to thank our Advisor Mr. Kenaw for his heart full guidance and valuable advice and also for Mr. Solomon. Thirdly we would like to thank Woldia University Institute of Technology head office, for partial willingness of interview, patience in answering to our numerous questions and support of different reading materials that help us to precede our project. Finally, even if it is usual the group members would like to thank each other. Teamwork, friendship and the belief that we may achieve something we set out to do are the main contributors to do this project document.

We also hope that this project and documentation may be testaments to our continued friendship and better work. Without helps of the particular that mentioned above, we would face many difficulties while doing this.

List of Acronyms

PC: Personal Computer

ID: Identifier

INT: Integer

HR: Human Resource

UI: User Interface

CSS: Cascading Style Sheet

DB: Database

HTML: Hypertext Markup Language

MySQL: Structured Query Language

OOD: Object Oriented Design

OOA: Object Oriented Analysis

ER: Entity Relationship

OOM: Object Oriented Modeling

OOSAD: Object Oriented System Analysis and Development

UC: Use Case

UML: Unified Modeling Language

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Abstract

The manual Academic Staff clearance process at Woldia University presents several challenges, including time inefficiency, data redundancy, and resource wastage. This project proposes a web-based Academic Staff Clearance System designed to automate and optimize the clearance process. The system will offer a centralized platform for Academic Staff to submit clearance requests, track the progress of their clearances, and receive digital approvals, eliminating the need for physical visits to various offices. By leveraging modern web technologies, the system aims to improve efficiency, minimize errors, and enhance user satisfaction for teachers, staff, and administrators. This document outlines the system's requirements, design methodologies, implementation strategies, and expected outcomes to ensure successful deployment and usability.

Chapter one

1.1. Introduction

Clearance is the status granted to faculty members, allowing them to complete their exit or transition process smoothly. It involves ensuring that all necessary permissions and obligations are met before a teacher leaves the institution. This process includes: verifying the teacher's responsibilities and obligations within the university, coordinating with relevant departments to confirm all necessary approvals and documentation, managing and issuing any required contracts or official forms and addressing any additional concerns related to the clearance process, such as returning university property or completing final evaluations.

Clearance is not granted based on rank or position alone. Once the clearance is successfully obtained, the teacher is granted access to complete the necessary steps for their departure and finalization of all outstanding tasks. The proposed Teacher Clearance System aims to address several challenges faced by the manual system, including: reducing the misuse of resources and minimizing human error, saving time by automating and streamlining the clearance process, providing a more convenient and efficient clearance process for faculty members and offering greater accountability and security for the organization, especially for those involved in managing and processing clearances.

1.2. Background of the organization

Woldia University, located in Woldia town the capital of the North Wollo Zone in the Amhara Region. It is a third-generation higher education institution situated about 521 kilometres from Addis Ababa, the capital of Ethiopia. Established on May 18, 2003 (EC), the university began its academic activities in 2004 EC with four faculties and 12 departments. Over the years, the university has grown significantly in terms of student population, academic staff, and administrative complexity. One of the important administrative processes in the university is the academic staff clearance system, which faculty members must complete when they leave the university or shift to other roles. Since its inception, Woldia University has relied on a manual clearance system that requires academic staff to collect clearance form from their department and visit various offices individually to obtain necessary approvals. In response to these challenges, the proposed Academic Staff Clearance System aims to modernize the process by offering a centralized, automated platform.

1.3. Statement of the Problem

At Woldia University, the process of clearing academic staff at the end of their tenure or when transitioning to new roles is handled through a traditional manual system, which presents numerous operational challenges. One of the major issues is the absence of a centralized and computerized data management system. Without digital integration, tracking the clearance status or accessing academic staff information across multiple departments becomes time-consuming and inefficient. Staff members are required to physically move between different offices to obtain approvals, which not only delays the process but also results in unnecessary consumption of time and resources. This is especially problematic when staff are working under tight schedules. Furthermore, the manual nature of the system increases the likelihood of data redundancy, as the same information is recorded in various locations, and heightens the risk of data loss due to misplaced or damaged paper documents. Errors such as missing signatures, incorrect entries, and incomplete records are also common, further complicating the process and often causing frustration among staff. Overall, the current system lacks the efficiency, accuracy, and convenience needed to support a smooth and reliable clearance process[1].

1.4. Objective of the Project

1.4.1. General Objective

The general objective of this project is to develop a web-based Academic Staff clearance system for Woldia University that automates and streamlines the clearance process efficiently and effectively**.**

1.4.2. Specific Objectives

The specific objectives of this project are:

- To analysis problems of the existing system.
- To gather and analysis requirements for the proposed system.
- To design the system based on the specified requirements identified during the analysis phase using OOM.
- To implement the system according to the designed specifications using OOM.
- To test the system using various testing metrics to ensure all required functionalities are implemented correctly using OOM.

1.5. Scope of the Project

This project is specifically designed for the academic staff clearance system at Woldia University. Currently, the university uses a manual, paper-based clearance system for its faculty members, which is inefficient and time-consuming. The scope of this project includes the following:

System for Woldia University Academic Staff: The system is intended for use by teachers at Woldia University only, to streamline and automate the teacher clearance process.

Centralized Record Management: The system will handle all clearance-related information, including records from the registrar and other relevant departments such as Human Resource, Library, Finance.

Request Submission: Academic Staff will submit their clearance requests through the system, eliminating the need for manual processing

Notifications: The system will send notifications to teachers and administrators to keep them updated on the status of clearance requests.

Administrator Control: The administrator will have full control over the system, including user management and overseeing the clearance process.

Profile Viewing: Academic Staff and authorized users will be able to view their personal profiles and clearance status within the system.

Review: Different departments review and mark their part as cleared.

Approval: Once all reviewers or departments have marked the academic staff as "cleared," the request moves to someone with authority to give final approval.

Reporting and Analysis: The system should provide reports and analytics to track clearance completion rates, overdue tasks, and any other performance metrics. Admins should be able to export these reports for analysis.

Download the approved clearance: After obtaining the necessary final clearance approvals, the academic staff member or university administrator will be able to download the Final Clearance Certificate in a PDF format.

Print the approved clearance: The system will allow the document to be printed directly from the application to ensure a hard copy is available for official use.

Language Support: The proposed system will be accessible in English, ensuring standardization and ease of use for English-speaking users.

The system will primarily handle the clearance of academic staff under various conditions such as:

- ✓ End of contract.
- ✓ Retirement.
- ✓ Transfer to another institution.
- ✓ Other situations requiring official clearance.

1.6. Methodology of the Project

The methodology of the project outlines the systematic approach used to gather data, design, develop, and implement the Academic Staff Clearance System at Woldia University. It encompasses the planning, analysis, design, development, testing, and deployment phases to ensure the system effective meets user needs and institutional requirements. The methodology is based on a structured software development life cycle (SDLC), incorporating both qualitative and quantitative data gathering techniques such as interviews, document analysis, and observation to understand current clearance processes and identify areas for improvement. Emphasis is placed on user-centered design to ensure ease of use for teachers and administrative staff, while iterative development and testing ensure the system's reliability, functionality, and efficiency. This methodological framework ensures that the final system is both practical and aligned with the university's operational goals[2].

1.6.1. Data Gathering Methodology

To design and develop the Academic Staff Clearance System, various data gathering techniques were employed to understand the existing manual process and identify key areas for improvement. The methods we used for data collection include:

Practical Observation: We physically observed the current manual clearance process used for academic staff at Woldia University. This observation allowed us to identify the inefficiencies and challenges teachers face when clearing from various departments.

Document Review: We examined various forms, documents, and clearance sheets used by the administration, registrar, and other relevant offices. By reviewing these documents, we gained insights into the data involved in the clearance process, the steps teachers need to follow, and the physical paperwork required to complete the clearance.

Document Analysis: In addition to reviewing forms, we analysed reports, guidelines, and other relevant documentation related to the clearance system. This helped us to better

understand the structure of the existing manual process and the specific data that needs to be tracked in the new system.

Interviews: To gather in-depth information about the current clearance process, we conducted interviews with key stakeholders, including administrators, staff involved in the clearance process, and teachers. These interviews provided valuable feedback on the challenges and pain points of the existing system, as well as suggestions for improvement in the new web-based system.

1.6.2. System Analysis and Design Methodology

For the development of the Online Academic Staff Clearance System for Woldia University, the team will adopt the **Object-Oriented System Analysis and Development (OOSAD)** methodology. This methodology involves two main phases:

Object-Oriented Analysis (OOA): In this phase, the team will focus on modelling the system's functions (use case modelling), identifying and organizing the business objects, establishing relationships between objects, and modelling the behaviour of the objects. The goal is to understand the system from a functional and structural perspective.

Object-Oriented Design (OOD): In this phase, the team will refine the use case models to reflect the implementation environment. This includes modelling object interactions and behaviours that support the use case scenarios and updating the object model accordingly to ensure it is aligned with the desired system outcomes.

We preferred the object-oriented approach for the following reasons:

Simplifies design and implementation by breaking down complex systems into manageable parts.

Increases reusability by allowing code to be reused through inheritance and modular design.

Facilitates easy system upgrades by ensuring flexibility and adaptability of system components.

Reduces communication complexity between developers and clients by enabling both static and dynamic design aspects to be visualized and easily communicated.

Given these advantages, the object-oriented approach is well-suited for the Online Teacher Clearance System at Woldia University.

1.6.3. System Development Model

The team has selected the **Agile Development Model** for this project due to its flexibility and efficiency in handling changes during the software development lifecycle (SDLC). The Agile model requires less time for design and documentation, making it easier to manage and

respond to errors as they occur. It supports both backward and forward steps, allowing developers to identify and fix issues promptly during each iteration. The Agile approach will allow the development team to rapidly adapt to changes, deliver incremental progress, and incorporate feedback from stakeholders, making it an ideal choice for this system. With Agile, the system is developed in small, iterative sprints. After each sprint, we have the opportunity to assess, adapt, and incorporate changes based on user feedback. This means, as new systems (like SIMS, finance systems, or other university modules) are introduced, we can adapt the system easily to integrate with them without needing to rework the entire system.

1.6.4. System Implementation Methodology

The development team has chosen **Phased Implementation** for the teacher clearance system due to its controlled and gradual rollout approach, which ensures a smooth transition for all users. This method allows for testing the system in stages, starting with a select group of teachers or departments, addressing any issues or feedback before expanding to other groups. By introducing the system incrementally, we can minimize the risk of disruption to critical administrative processes, provide time for training and user adaptation, and gather valuable feedback to refine the system at each stage. This approach ensures the system is tailored to meet the unique needs of each department, enhances user adoption, and reduces the chances of failure during full deployment, making it the most efficient and risk-averse choice.

1.6.5. System Testing Methodology

To ensure the functionality, security, and usability of the Online Academic Staff Clearance System, the following testing methodologies will be implemented:

Unit Testing

Objective: Validate the functionality of individual components or modules.

Scope: Focus on isolated features such as user authentication (login and logout), form submissions for clearance requests, notifications for status updates.

Tools: Jest for testing React components and Mocha with Chai for testing Express APIs and back-end logic.

Integration Testing

Objective: Ensure smooth interaction between integrated modules.

Scope: focus on the features like interaction between the clearance form and database, communication between the clearance module and financial systems and API calls for notification systems (such as email).

Tools: Supertest for testing API interactions between the React front-end and Express back-end.

System Testing

Objective: **Validate the complete system for functionality and performance as per requirements.**

Scope:

Test end-to-end workflows, such as a teacher submitting a clearance request and receiving approval.

Assess system behaviour under various conditions like user role permissions.

1.6.6. Development Environment and Programming Tools

Software Tools

Tools	**Activities**
Visual studio code	For editing code
CSS	For attractive layout
ReactJS	For frontend development(client-side coding)
Express and NodeJs	For backend development
MySQL	Database
Google chrome, Internet explorer	For browsing
MS Office Word 2013	For documentation
MS Office PowerPoint 2007	For presentations
MS Office Visio 2007 and EdrawMax	For UML diagrams and design

Table 1: software tools

Hardware Tools

Tools	**Activities**
Hard Disk	To store documents

CD-ROM 700MB	To store files permanently
Flash Disk 8GB	To transfer files from device to device
Printer	To print documents

Table 2: hardware tools

1.7. Feasibility Study

Feasibility analysis enables the system to determine either or not the project can be developed, evaluates and identifies the newly developed system. Therefore, the feasibility analysis of proposed system involves the following feasibility:

1.7.1. Technical Feasibility

We have analyzed that developing the **Online Academic** Staff **Clearance System** is technically feasible in the institution. The required technologies and the university's existing infrastructure, including server capacity and network resources, is compatible with the demands of the system, though minor upgrades may be required for peak load times. The development team possesses sufficient expertise in the necessary technologies, although some specialized training may be needed in areas like security and advanced front-end development. Additionally, the system will be designed to meet performance and security requirements, including secure authentication and scalability, to ensure smooth operation under varying traffic conditions. Overall, the system's development is technically viable with the current resources and infrastructure at the University.

Operational Feasibility

Woldia University's **operational feasibility** for the development of the **Online Academic Staff Clearance System** has been assessed by examining several key factors. The system aligns well with the university's existing administrative processes and will streamline the teacher clearance procedure, reducing manual workload and improving efficiency. The university has the necessary resources, including administrative and IT staff, to manage, support, and maintain the system post-deployment. Additionally, the system's user interface is designed to be intuitive, ensuring that faculty, students, and administrative staff can easily adopt it without significant training or disruption. The university also has a plan for ongoing system updates and maintenance, ensuring the system remains functional as the university grows. Overall, the **Online Teacher Clearance System** is operationally feasible and can be

smoothly integrated into the university's current workflow, with scalable capabilities to adapt to future needs.

1.7.2. Economic Feasibility

The economic feasibility of developing the Online Academic Staff Clearance System has been carefully assessed through a detailed cost-benefit analysis. The system is considered economically viable due to both tangible and intangible benefits. Tangibly, it will reduce operational costs by automating the clearance process, lowering labor demands, minimizing errors, and cutting down on time and resources spent on corrections. Its scalable and user-friendly design also ensures low long-term maintenance costs. Intangibly, the system will improve the university's image by offering a modern, efficient, and transparent process that enhances user satisfaction and administrative productivity. Overall, the long-term benefits clearly justify the investment. To clarify both the tangible and intangible benefits of the project:

1.7.3. Tangible benefits

- ✓ Using less manpower than the existing system.
- ✓ Increase speed of activities and competence.
- ✓ Reduce cost that will be spend for materials and manpower of manual system.
- ✓ Reduce wastage of time for the clearance process.

1.7.4. Intangible benefits

- ✓ Facilitating information processing.
- ✓ Knowledge required by project developer.
- ✓ Update information timely.
- ✓ Increase the competitiveness of the individual.
- ✓ Improve productivity in the tech world.
- ✓ Improving the morale of our team.

1.7.5. Political or Behavioural Feasibility

The development of the Online Academic Staff Clearance System at Woldia University has been evaluated for political feasibility, with strong institutional backing ensuring a smooth implementation. The project supports the university's strategic objectives of enhancing administrative efficiency and advancing digital transformation. It has received widespread

support from senior leadership, including the IT department, administrative units, and faculty representatives, all of whom recognize the long-term value of automating the clearance process. To ease adoption, the system features a user-friendly interface and is supported by a clear training plan aimed at reducing resistance from staff used to manual procedures. By engaging key stakeholders early and addressing potential concerns, the project is well-positioned to encourage collaboration and ensure successful integration across all departments.

1.8. Significance and Beneficiary of the Project

1.8.1. Significance of the Project

- The **Academic Staff** Clearance System at Woldia University offers several key benefits, ensuring that the process of clearing teachers at the end of each academic year is efficient, transparent, and accurate. The main significance of the system are:
- The system automates the clearance process, reducing the time and effort required for teachers and administrative staff to complete clearance tasks.
- The system facilitates a structured inventory management process for the university's assets.
- The system significantly reduces the workload for both faculty and administrative staff.
- The system reduces the chance of human error that can occur in the manual clearance process, such as missing forms or incorrect data entries.
- The system ensure that teachers and administrative staff are accountable for the return of materials, equipment, and completion of clearance tasks.
- The system optimizes workflow, making it easy for both teachers and administrative staff to track progress, identify bottlenecks, and resolve issues quickly.
- The system helps ensure that university property is returned in a timely and organized manner at the end of each academic year.
- The clearance system ensures that all clearance tasks are completed before the academic year transitions, making the process smoother for both teachers and administrators.
- The system ensures that teachers comply with university policies and procedures when clearing their responsibilities.

- The system generates real-time reports and data about the clearance process, helping university management make informed decisions.
- The system is designed with the potential for future integrations with other university systems (such as finance or student information management systems) hence it will enhance overall operational efficiency in the long term as the system evolves.

1.8.2. Beneficiary of the Project

The implementation of the Academic Staff Clearance System at Woldia University offers numerous benefits for various stakeholders within the university community. Some of the main beneficiaries of the project are:

Academic Staff

Academic Staff benefit from the Teacher Clearance System as it provides a streamlined, efficient process for clearing their responsibilities at the end of the academic year. It reduces the time and effort spent on manual clearance forms and interactions with multiple departments. Teachers can quickly return materials and equipment, and complete any required tasks, saving time and ensuring compliance with university policies without unnecessary delays.

Administrative staff

The system significantly reduces the administrative burden by automating clearance processes and minimizing paperwork. It allows staff to manage clearance requests more efficiently, track returns, handle approvals, and ensure that all records are up-to-date and accurate. This improves productivity and reduces errors associated with manual tracking.

University property and asset management

The university can manage its assets and resources (such as books, equipment, and teaching materials) more effectively. The system ensures that these items are returned on time and properly recorded, minimizing the risk of loss or damage. This facilitates inventory management and reduces the need for manual audits, ultimately saving time and resources.

Academic departments

Academic departments benefit from improved organization and coordination. The system ensures that teachers are properly cleared, making the transition between academic years smoother. It also supports the efficient management of departmental resources, as teachers' returns are accurately tracked.

University management

The system provides university management with real-time data and reports regarding the clearance process, enabling better decision-making and resource allocation. Automating this process helps ensure compliance with university policies, reduces delays in teacher transitions, and enhances overall institutional efficiency.

Chapter Two

Business Area Analysis and Requirement Definition

2.1. The Existing System

The current teacher clearance processing system at Woldia University is a manual system that requires substantial human labor and resources, is time-consuming, and lacks sufficient security measures. This system involves teachers visiting multiple offices across the campus, completing clearance forms, and obtaining signatures from the respective offices to confirm that they have fulfilled their responsibilities. The manual process of gathering signatures and completing the necessary paperwork takes several days to complete, causing unnecessary stress for both the teachers and administrative staff involved. This approach not only creates delays but also increases the risk of human errors, missing documentation, or lost information, thereby further complicating the clearance process. To understand the challenges of the current system, it is essential to break down its components, including the roles, business rules, and workflows involved in the process. This explanation serves to highlight the inefficiencies of the existing system and provide clarity on how it operates. By identifying the weaknesses, the goal is to simplify and improve the clearance process, ultimately leading to a more efficient, secure, and streamlined solution. By providing a clear and concise overview of the existing system, we can better communicate the issues at hand, making it easier for external stakeholders to understand and align with the proposed improvements.

2.1.1. Drawback of The Existing System

The existing manual teacher clearance system at Woldia University has several drawbacks, including the extensive time and human labour required to complete the process. Teachers must visit multiple offices and manually fill out forms to obtain signatures, which can take several days, leading to delays and unnecessary stress for both teachers and administrative staff. Additionally, this manual process increases the risk of human errors, such as missing or incorrect documentation, and the possibility of lost records. The lack of adequate security and streamlined workflows further complicates the system, making it inefficient and prone to mistakes, which negatively impacts the overall clearance process.

2.1.2. Business Rule of the Existing System

a. Initiation of Clearance request

The teacher submits a formal request letter or clearance application to the human resource office. The purpose (e.g. resignation, retirement, transfer, leave) is stated. Then the clearance form is issued to the teacher by printed form as shown in appendix A. Then the academic research and community engagement vice president puts his/her signature to indicate that he/she is agreed on the staff clearance.

b. Distribution of clearance form

The form includes sections for various departments to sign and indicate that the academic staff member has no pending issues. The teacher is responsible for personally visiting each relevant department with the form.

c. Departmental Clearance process

The teacher must obtain signatures from the following departments or units.

No.	Department	Responsibilities checked
1.	Academic Department	Return of academic materials, course handover
2.	Registrar	Submission of academic grades
3.	Student Dean	Mentorship or Advisory Responsibilities
4.	Distance and continuing Education	Completion of Special Program Commitments
5.	Research Directorate	Research handover, grant closure
6. 7.	_____ College	Return of academic materials, course handover
8	_____ Department	Return of academic materials, course handover
9	Woldia university Employee's finance enterprise	Settlement of any loans, advances
10	Library	Return of all borrowed books and resources
11	General Service Executive	
12	Property Executive Director	Asset Return Check and Verification Approve Clearance
13	Store 1	Return of Issued Equipment
14	Store 2	Return of Issued Equipment
15	Property Registration and	Asset Registry Reconciliation

	Control Specialist 1	
16	Property Registration and Control Specialist 2	Asset Registry Reconciliation
17	Internal audit executive Director	Review of Financial Transactions
18	Finance Executive	Settlement of any dues, loans, advances
19	Senior finance specialst	Settlement of any dues, loans, advances
20	Treasurer	Settlement of any dues, loans, advances
21	Ethics and Anti-Corruption Monitoring Executive	Verification of Ethics Compliance
22	ICT Executive	Check health of laptop and other electronic materials, ID card, email deactivation
23	Community engagement Directorate	Project handover, grant closure
24	Competency and Human Resources Management Executive	Collection of resignation acceptance/retirement benefits processing
25	Records and Archives	Ensure all official documents handled by the teacher
26	Office and classroom facilities specialist	Return of Office and classrooms Keys/Access Cards
27	Case executive	Completion of Service Records
28	Human Resources Competency and Development Team Leader	Mandatory training agreement Compliance

Table 3: departments and their responsibility in the existing system

d. Submission and Verification

Once all departments have signed the clearance form then the academic research community engagement and technology transfer vice president will give his decision and approval. The

teacher returns it to the human resource or registry office. The form is reviewed to confirm completeness and authenticity of signatures.

e. Final approval

If everything is in order a clearance certificate or official letter is issued to the teacher. This certificate may be required to process final salary, pension, benefits or exit documents.

2.2. The Proposed System

The proposed system aims to enhance the administrative processes of Woldia University by implementing a comprehensive digital management platform. This system is designed to streamline various administrative functions, including human resource management and student services, enabling efficient data collection, processing, and reporting. By digitizing the information traditionally recorded on paper, the solution will not only reduce the likelihood of errors but also facilitate quick access to essential information, thereby improving overall operational efficiency. Additionally, the system will provide user-friendly interfaces for both administration and students, allowing for better communication and engagement within the university community.

2.2.1. Business rule of proposed system documentation

1. Log into the System
   - Teachers securely log into the clearance system by entering their unique username and password.
   - Upon successful authentication, they gain access to their personal dashboard, where they can review their current clearance status and other relevant details.

2. Initiate the Clearance Request
   - Teachers navigate to the Start Clearance section in the system.
   - They select the appropriate reason for clearance, such as:
     - ✓ End of contract
     - ✓ Retirement
     - ✓ Transfer to another institution
   - To complete the initiation process, teachers upload the necessary supporting documents, including resignation letters or transfer requests.

3. Review and Update Personal Profile
   - Teachers review their personal profile to verify the accuracy of their details, such as:
     - ✓ Department

- ✓ Job position
- ✓ Years of service
- ✓ Full name
- ✓ Employee ID or staff number
- ✓ Department or subject area
- ✓ Contact information
- ✓ Date of clearance or departure
- ✓ Reason for clearance
- ✓ Principal's approval
- ✓ Date of submission

- ➢ Teachers must make the necessary changes on contact information (such as email addresses) to ensure they receive timely notifications throughout the process.

4. Submit the Clearance Form

- ➢ Teachers complete the online clearance form by accurately filling in all required fields.
- ➢ Upon submission, the system generates a confirmation message along with a unique reference number that enables teachers to track the progress of their clearance request.

5. Track Departmental Clearance Progress

- ➢ Teachers monitor the clearance status of each department involved in the process. Concerned departments are:
  - ✓ Registrar
  - ✓ Library
  - ✓ Finance
  - ✓ Human Resources (HR)
- ➢ The system provides real-time updates, marking departments as cleared upon completion of their review.
- ➢ Teachers can easily identify which departments are pending clearance.

6. Resolve Department-Specific Issues

- If a department flags an issue such as outstanding fines, unreturned books, or missing records the system immediately notifies the teacher through browser notifications.
- Teachers are required to follow up directly with the flagged department, resolve the issue, and ensure that their status is updated in the system accordingly.

7. Receive Department Clearance Notifications
   - As each department completes its review, teachers receive browser notifications.
   - These updates allow teachers to stay informed and track which departments have successfully cleared their records and which are still pending.
8. Await Final Clearance Approval
   - Once all relevant departments have granted clearance, the system automatically forwards the request to the admin office.
   - Teachers receive a system-generated notification upon official approval of their clearance.
9. Download the Clearance Certificate
   - After final approval, teachers access their profile within the system to download the official digital clearance certificate.
   - This document can be printed or saved for personal records.
10. Download the Service or Experience Letter
    - If teachers require a service or experience letter, they submit a request through the system.
    - Once the letter is generated and approved, teachers can download it directly from their profile.
11. Exit the System
    - Upon completing all clearance-related tasks, teachers securely log out of the system to safeguard their account and personal information.
    - Once a teacher has completed all clearance tasks and received final approval, the system admin deactivates their account.
    - This prevents the teacher from accessing the system after officially leaving the university.

2.3. Requirement Analysis

2.3.1. Functional Requirements

The functional requirements of the system are:

- The system must allow teachers to register on the system by providing their name, department, employee ID, and contact information.
- The system should generate a personalized checklist for each teacher, outlining the specific tasks or requirements they need to complete before clearance.
- Teachers should be able to mark items on the checklist as completed once they fulfil each requirement.
    - ✓ After performing a certain task, a teacher marks that task as completed.
    - ✓ And the system updates the status of the checklist.
- The system should track the completion status and notify teachers if anything is pending
- The system should send automated reminders and notifications to teachers when a task is due or when the deadline is approaching.
- The system should allow for task approvals and provide an approval workflow.
    - ✓ A department head reviews and approves the final grade submissions of a teacher before they are marked as cleared.
- Both administrators and teachers should have access to a dashboard showing their status in the clearance process.
    - ✓ Admins can see the overall status of all teachers in the department.
    - ✓ Teachers can see their progress, which tasks have been completed and which ones are pending.
- The system should have different access levels depending on the user's role such as teacher, administrator, librarian and so on will have specific permissions for viewing and performing actions.
    - ✓ A teacher can only mark their own tasks as complete.
    - ✓ An admin can approve or reject tasks and manage the list of teachers.
- The system should provide reports and analytics to track clearance completion rates, overdue tasks, and any other performance metrics.

- The system should allow some clearance tasks that are specific to certain departments or services to be assigned to these departments for tracking.
- The system should maintain an audit trail, recording when tasks are assigned, completed, or approved[3].

2.3.2. Non-functional Requirements

These describe how the system performs its functions and ensuring that the system is efficient, reliable, and secure. These are requirements such as:

- The system should be user-friendly and intuitive for both teachers and administrators.
  - ✓ The Teachers should be able to easily navigate the system to view their tasks.
  - ✓ Administrators should be able to efficiently manage clearance processes.
  - ✓ The interface should be simple, with clear navigation and easy-to-understand instructions or icons.
- The system should be scalable to handle an increasing number of users and tasks as the university grows.
- The system should be able to handle multiple users logging in simultaneously without delays or crashes.
- The system should have a minimal downtime rate, with automated recovery mechanisms in place to handle failures.
- The system must ensure that all data is securely stored and transmitted.
- The system must have proper authentication and authorization mechanisms.
- The system should ensure that the data entered is accurate, consistent, and protected from corruption or loss.
- The system should be flexible enough to incorporate requirement change without significant restructuring.
- The system should perform regular backups of all clearance data and allow for easy restoration if needed.

2.4. System Requirements

System requirements define the essential hardware, software, and functional conditions needed for a system to operate effectively. These are typically divided into two main categories**.**

2.4.1. Hardware System Requirements

. Based on this the system requires the following hardware specification:

- Server-Side Requirements for hosting the system
  - ✓ Processor: Intel Xeon or AMD Ryzen.
  - ✓ RAM: Minimum 8GB.
  - ✓ Storage: Minimum 512GB SSD.
  - ✓ Network: High speed internet connection.
  - ✓ Operating System: Window Server.
  - ✓ Back-up System: Cloud-based or external storage.
- Client-Side Requirements for Users
  - ✓ Processor: Intel core i3 or higher.
  - ✓ RAM: Minimum 4GB
  - ✓ Storage: Minimum 256GB SSD or HDD.
  - ✓ Display: Minimum of 1366 x 768 resolution.
  - ✓ Internet Connection: Stable broadband or Wi-Fi connection.

2.4.2. Software System Requirements

Our system requires the following software requirements:

- Server-Side Software Requirements
  - ✓ DBMS: MySQL
  - ✓ Web Server: Apache
  - ✓ Database Server:XAMMP Server
  - ✓ Programming Language: HTML(mark up), CSS(style sheet) and Javascript
  - ✓ Framework: Express.js(Node.js)
  - ✓ Backup software: Google Drive
- Client-Side Software Requirements
  - ✓ Operating System: Window 10/11

- ✓ Web Browser: Google Chrome
- ✓ PDF Reader: WPS
- ✓ Security Software: Antivirus Software for data protection

2.5. System Use case

Actors of the sytem are listed below with their main role:

1. Academic staff

Role:

Logs into the system to initiate and track their clearance process.

Submits necessary documents, reviews their profile, and requests clearance.

Downloads the clearance certificate and service or experience letter once cleared.

Logs out after the clearance process is complete.

Registrar

Role:

Reviews academic staff clearance requests and verifies academic records.

Approves or flags the clearance request based on the academic staff's academic standing.

2. Library Staff

Role:

Verifies that all library books have been returned by the academic staff.

Checks for and flags any outstanding library fines.

Approves or flags library clearance based on the academic staff's status.

3. Finance Department

Role:

Reviews the academic staff's financial obligations, such as unpaid loans or fees.

Approves or flags financial clearance based on pending financial matters.

4. Human Resources (HR)

Role:

Verifies employment records of the academic staff.

Approves or flags clearance based on the academic staff's contract status (resignation, retirement, transfer).

5. Department Head

Role:

Reviews and approves the academic staff's clearance request based on department-specific requirements.

Grants departmental approval for the academic staff clearance request.

6. System Administrator

Role:

Creates and manages user accounts and access level.

Ensures the system's security, including user permissions and access levels.

Provides technical support and handles user-related issues.

Maintains system backups and ensures data integrity.

Generates reports on clearance progress and completion.

7. Registrar Office

Role:

Receives the final clearance request after all departmental approvals.

Grants final clearance and issues the clearance certificate to the academic staff.

2.5.1. Use case diagram

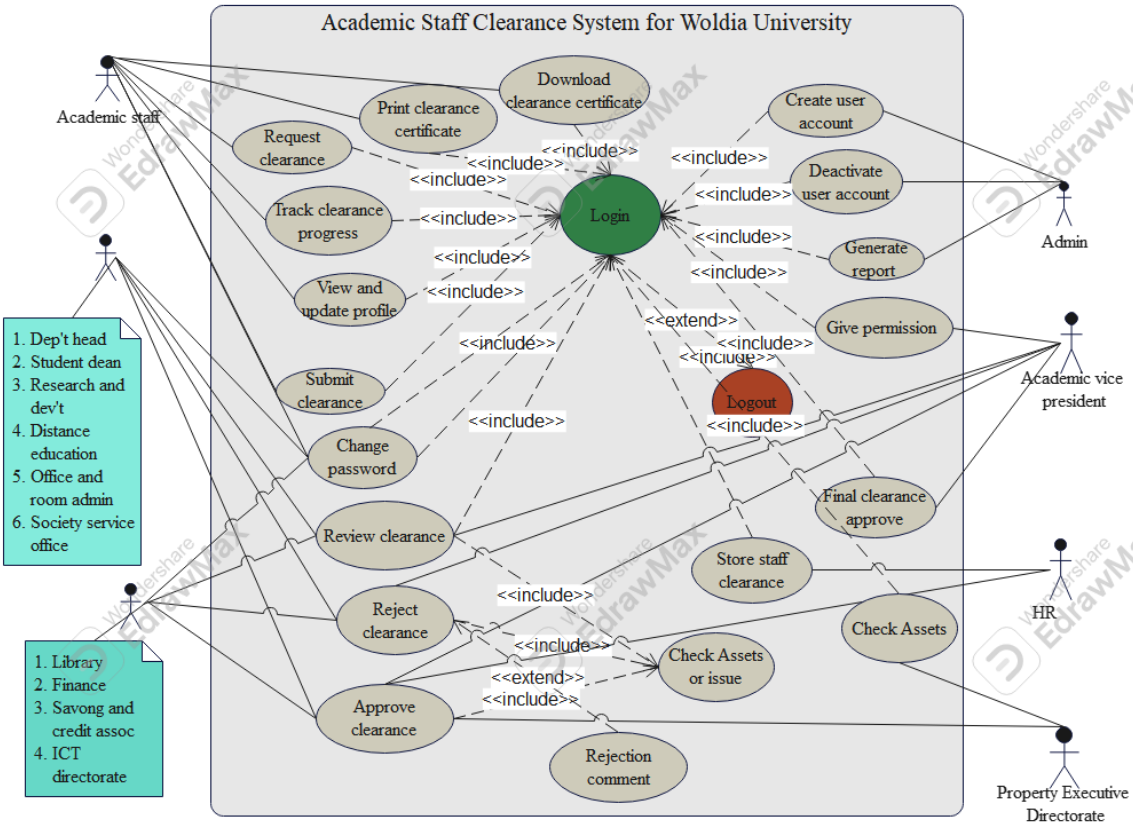
Academic Staff Clearance System for Woldia University
Academic staff
Download clearance certificate
Print clearance certificate
Request clearance
Track clearance progress
View and update profile
Submit clearance
Change password
Review clearance
Reject clearance
Approve clearance
Rejection comment
Login
Logout
Create user account
Deactivate user account
Generate report
Give permission
Final clearance approve
Store staff clearance
Check Assets
Check Assets or issue
<<include>>
<<extend>>
Admin
Academic vice president
HR
Property Executive Directorate
1. Dep't head
2. Student dean
3. Research and dev't
4. Distance education
5. Office and room admin
6. Society service office
1. Library
2. Finance
3. Savong and credit assoc
4. ICT directorate

Figure 1: use case diagram

2.5.2. Use case description

Use case descriptions provide clear, structured information to developers and stakeholders on how a particular feature of the system should behave in real- world scenarios. list of use cases and their description is given below using tabular format.

Use case ID	UC-01
Use case Name	Create account
Description	The system administrator registers new users by entering their details and assigning appropriate roles and access permissions
Goal	Allow the system administrator to create new user accounts for academic staff and other personnel.
Actors	System admin
Pre-condition	The system admin must be logged in with the necessary permissions.

Main flow	1. The system admin navigates to the user management section. 2. The system admin enters user details (name, email, role, department). 3. The system validates the entered information. 4. The system generates login credentials. 5. The system admin confirms and submits the new user account creation. 6. The system notifies the user via email with login credentials.
Alternative flow	If mandatory fields are missing or invalid, the system prompts the admin to correct them before proceeding.
Post condition	A new user account is successfully created and ready for use.
Business rule	User roles must be assigned correctly based on their department and responsibilities
Assumptions	The system admin has the authority to create new users and assigns roles appropriately.

Table 4: create account use case description

Use case ID	UC-02
Use case Name	Login
Description	Users must provide valid credentials (username, email and password) for authentication to gain access to the system.

Goal	Secure login to the system for teachers, administrators, and staff.
Actors	All users.
Pre condition	User must have a registered account and be able to access the login page.
Main flow	1. User enters username,email and password. 2. System validates credentials. 3. If valid, access is granted; if invalid, an error message is shown.
Alternative flow	If credentials are incorrect, the user is prompted to re-enter them or reset the password.
Post condition	User gains access to the system dashboard if credentials are valid.
Business rule	The system must securely store and verify passwords.
Assumptions	Users know their credentials and have access to the login interface.

Table 5: login use case description

Use case ID	UC-03
Use case Name	Initiate clearance request
Description	The academic staff navigates to the clearance request page, selects a reason for clearance, and uploads the required documents.

Goal	Begin the clearance request process by selecting a clearance reason and uploading necessary documents.
Actors	Academic staff
Pre-condition	The user must be logged into the system.
Main flow	1. The academic staff login with valid credentials. 2. The academic staff selects the reason for clearance. 3. The staff uploads the required documents. 4. The system generates a clearance request with a reference number.
Alternative flow	If any documents are missing, the system notifies the user to upload them before proceeding.
Post condition	The clearance request is created and ready for processing with a unique reference number
Business rule	The academic staff must request the clearance and upload the correct supporting documents for clearance.
Assumptions	The academic staff is aware of the reason for clearance and has the necessary documents ready to upload.

Table 6: initiate clearance request use case description

Use case ID	UC-04
Use case Name	Review and update profile

Description	The academic staff reviews their profile, verifies their information, and makes necessary updates (e.g., department, contact information).
Goal	Ensure personal details are up-to-date and accurate before proceeding with the clearance process.
Actors	Academic staff
Pre-condition	The user must be logged into the system.
Main flow	1. The academic staff reviews their personal profile details. 2. The academic staff updates any outdated information (e.g., contact information). 3. The academic staff saves the changes.
Alternative flow	If the staff does not make any changes, they can continue without saving.
Post condition	The profile is updated with the correct information, ensuring accuracy for the clearance process.
Business rule	Academic staff information must be up-to-date to ensure proper notifications.
Assumptions	The academic staff is aware of their personal details and has access to the profile section.

Table 7: review and update profile use case description

Use case ID	UC-05
Use case Name	Submit clearance form

Description	The academic staff fills out the clearance form and submits it for approval by the relevant departments and administrators.
Goal	Submit a completed clearance form to initiate the approval process.
Actors	Academic staff
Pre condition	The clearance request must be initiated with all required fields filled.
Main flow	1. The academic staff completes the clearance form. 2. The academic staff submits the form. 3. The system generates a confirmation message and a reference number.
Alternative flow	If any fields are incomplete or incorrect, the system prompts the user to fix the issues before submitting.
Post condition	The clearance form is submitted, and the system generates a confirmation message with a unique reference number.
Business rule	All fields in the clearance form must be filled before submission.
Assumptions	The academic staff has filled out the required information and is ready to submit the form.

Table 8: submit clearance form use case description

Use case ID	UC-06
Use case Name	Give Permission

Description	This use case describes how the Vice President reviews a user's clearance request and provides approval (Permission) based on the justification and related details provided.
Goal	To allow the Vice President to review and either approve (give Permission) or reject a clearance request based on the validity and completeness of the provided justification.
Actors	Academic Vice President
Pre condition	The Vice President is successfully logged into the system. A clearance request is submitted and currently pending approval at the Vice President's level.
Main flow	1. Vice President logs into the system. 2. The system displays a dashboard with all pending clearance requests. 3. Vice President selects a specific clearance request. 4. The system shows the details of the request, including the reason for clearance. 5. Vice President reviews the reason and relevant information. 6. Vice President clicks the "Give Permission" button. 7. The system records the permission and updates the request status. 8. The system notifies the next responsible office or finalizes the clearance process as per the workflow.

Alternative flow	1. If reason is insufficient or invalid: ➢ Vice President rejects the clearance request or returns it for correction. ➢ The system notifies the requester about the rejection or request for correction.
Post condition	The clearance request is either: ➢ Approved with Permission and forwarded to the next stage or marked as complete. ➢ Rejected with appropriate notifications sent to the requester.
Business rule	1. Permission can only be granted by an authorized Vice President. 2. The clearance request must contain a valid and complete reason before approval. 3. Rejected or returned requests must include comments or reasons for the action. 4. All actions taken must be recorded in the system for audit purposes.
Assumptions	5. The clearance workflow includes the Vice President's approval as a necessary step. 6. The Vice President has access to all required information for making an informed decision. 7. Notifications are automatically triggered

	upon status change of the request. 8. The system ensures that only authorized personnel can give or revoke Permission.

Table 9: give permission use case description

Use case ID	UC-07
Use case Name	Track clearance progress.
Description	The academic staff can track the clearance status for each department involved in the process and identify which departments have cleared their records.
Goal	Monitor the clearance progress within each department (e.g., Library, Finance, HR).
Actors	Academic staff
Pre condition	The clearance request must be submitted, and departments must have started processing it.
Main flow	1. The system displays the current clearance status for each department. 2. The academic staff views which departments have cleared the request.
Alternative flow	If a department has not reviewed the request, the status is shown as "Pending".
Post condition	The academic staff is updated on the clearance status for each department.
Business rule	The system must update clearance progress in real-time for each department.

Assumptions	Departments are actively reviewing the clearance requests and updating the status.

Table 10: track clearance progress use case description

Use case ID	UC-08
Use case Name	Approve clearance
Description	Department staff review clearance requests and approve them if the academic staff has met all departmental obligations.
Goal	Allow various departments to review, approve, or reject clearance requests submitted by academic staff.
Actors	Finance Department, Library Department,Property Executive Directorate, Human Resources (HR), Other Relevant Departments.
Pre condition	1. The academic staff has submitted a clearance request. 2. The department staff is logged in with necessary permissions.
Main flow	1. Department staff accesses the clearance request list. 2. System displays pending requests assigned to the department. 3. Staff reviews the request and checks for any outstanding obligations. 4. If no obligations remain, staff approves the request. 5. System updates the request status to

	"Approved" and notifies the academic staff.
Alternative flow	1. If obligations are unmet (e.g., unpaid dues, missing documents, outstanding books), the department rejects the request and provides a reason. 2. The system notifies the academic staff about the rejection and required actions. 3. The academic staff takes corrective measures and resubmits the request.
Post condition	The clearance request is marked approved and moves to the next processing stage.
Business rule	1. The department must verify that the academic staff has no outstanding dues or responsibilities before approval.
Assumptions	1. The department staff has authority to approve requests and the system reflects real-time obligation status.

Table 11: review and approve use case description

Use case ID	UC-09
Use case Name	Reject clearance
Description	Department staff reject clearance requests if the academic staff has unmet obligations and must provide a reason for rejection.
Goal	Allow departments to reject clearance requests with a valid explanation when obligations are unmet.
Actors	Finance Department, Library Department, Human Resources (HR), Other Relevant Departments.

Pre condition	1. The academic staff has submitted a clearance request. 2. The department staff is logged in with necessary permissions.
Main flow	1. Department staff accesses the clearance request list. 2. System displays pending requests assigned to the department. 3. Staff reviews the request and finds outstanding obligations (e.g., unpaid dues, unreturned items). 4. Staff rejects the request and enters a reason for rejection as a comment. 5. System updates the request status to "Rejected" and notifies the academic staff, including the rejection reason.
Alternative flow	1. If obligations are unmet (e.g., unpaid dues, missing documents, outstanding books), the department rejects the request and provides a reason. 2. The system notifies the academic staff about the rejection and required actions. 3. The academic staff takes corrective measures and resubmits the request.
Post condition	The clearance request is marked as rejected, and the academic staff is informed of the necessary actions for resubmission as a comment.
Business rule	All rejected requests must include a clear and valid reason for rejection as a comment.

Assumptions	Department staff have the authority to reject requests and communicate with the academic staff.

Table 12: review and reject use case description

Use case ID	UC-10
Use case Name	Rejection comment
Description	When a department rejects a clearance request, authorized staff can add a comment explaining the specific reason for the rejection.
Goal	Enable department staff to clearly communicate the reason for rejecting a clearance request, helping academic staff understand what must be resolved.
Actors	Finance Department, Library Department, Human Resources (HR), Other Relevant Departments.
Pre condition	1. The clearance request has been submitted by an academic staff member. 2. The department staff is logged in and authorized to process requests.

Main flow	1. Department staff accesses a pending clearance request. 2. Upon identifying unmet obligations, the staff chooses to reject the request. 3. The system prompts the staff to enter a comment detailing the reason for rejection. 4. The staff submits the rejection along with the comment. 5. The system stores the comment, updates the request status, and notifies the academic staff.
Alternative flow	If the staff tries to submit a rejection without a comment, the system displays a validation message requiring a reason before proceeding.
Post condition	The clearance request is rejected, and the academic staff receives the specific reason for the rejection via system notification.
Business rule	1. Every rejected clearance must be accompanied by a clear and specific comment. 2. Comments should be professional, actionable, and logged.
Assumptions	1. Department staff are trained to provide valid reasons for rejection. 2. Academic staff will use the feedback to address the issues promptly.

Table 13: rejection comment use case description

Use case ID	UC-11
Use case Name	Change username and password

Description	Users can change their login credentials to enhance account security or update outdated information.
Goal	Allow academic staff or system admin to update their username and/or password for security reasons.
Actors	All registered user.
Pre condition	The user must be logged into the system with valid credentials.
Main flow	1. The user enters the current username or password. 2. The system verifies the current credentials. 3. The user enters the new username or password. 4. The system validates the new credentials for uniqueness and security. 5. The system updates the username/password and confirms the change.
Alternative flow	If the new username or password does not meet the system's security standards, the user is prompted to correct it.
Post condition	The system successfully updates the username and/or password and confirms the change.
Business rule	The system must enforce password security standards like length and combination of character for password and username.

Assumptions	The user has valid current credentials and can access the account settings page.

Table 14: change username and password use case description

Use case ID	UC-12
Use case Name	Generate report
Description	The registrar admin can generate customized reports to monitor the clearance process of academic staff, including pending tasks or approvals by different departments.

Goal	Allow the registrar admin to generate reports on clearance progress, pending tasks, and overall staff clearance.
Actors	system admin
Pre-condition	The registrar admin is logged into the system and has access to the report generation interface.
Main flow	1. The registrar admin logs into the system. 2. The registrar admin navigates to the report section. 3. The registrar admin selects the type of report (clearance progress, pending tasks, etc.). 4. The system processes the request and generates the report. 5. The system displays the report and allows the registrar admin to download or print it.
Alternative flow	If no data matches the selected filters, the system displays a message indicating no results found.
Post condition	A report is generated and available for download or printing by the registrar admin.
Business rule	Reports must reflect accurate and up-to-date data for clearance status, academic staff progress, and pending tasks.
Assumptions	The registrar admin has access to the relevant clearance data and necessary permissions to generate reports.

Table 15: generate report use case description

Use case ID	UC-13
Use case Name	Final clearance approve
Description	After academic staff has completed all departmental clearance tasks, the registrar admin reviews and approves the final clearance before the staff member can exit the university.
Goal	Allow the registrar admin to approve the final clearance of academic staff once all departments have reviewed and cleared the records.
Actors	Academic vice president
Pre condition	All departments (Library, Finance, HR, etc.) have completed their clearance tasks for the academic staff member.
Main flow	1. The registrar admin logs into the system. 2. The system displays the clearance status of the academic staff member with all departmental approvals. 3. The registrar admin verifies that all clearance tasks are completed and approved by the relevant departments. 4. The registrar admin approves the final clearance. 5. The system updates the academic staff member's clearance status and notifies the staff member.

Alternative flow	If any department has not approved the clearance, the registrar admin holds the approval process and notifies the academic staff member to resolve the issue.
Post condition	The academic staff member's clearance status is updated to "finalized," and they are officially cleared to leave the university.
Business rule	The registrar admin can only approve the final clearance after all departments have cleared the staff member's records.
Assumptions	The registrar admin has access to all the necessary clearance data and permissions to approve the final clearance.

Table 16: final clearance approval use case description

Use case ID	UC-14
Use case Name	Store staff clearance
Description	The registrar admin stores the academic staff's final clearance status in the system once all departments have reviewed and approved their clearance records.
Goal	Allow the registrar admin to store the final clearance status of academic staff in the system after all clearance tasks have been completed and approved.
Actors	Academic vice president, HR
Pre condition	All departments (Library, Finance, HR, etc.)

	have completed their reviews, and the final clearance has been approved.
Main flow	1. The registrar admin logs into the system. 2. The registrar admin verifies that all departmental approvals have been received. 3. The registrar admin updates the academic staff's clearance status to "cleared" in the system. 4. The system stores the clearance status and updates the staff member's profile. 5. The system notifies the academic staff member of the completed process
Alternative flow	If any department has not approved the clearance, the registrar admin holds the process and notifies the academic staff member to resolve the issue.
Post condition	The staff member's final clearance status is stored, and they are officially cleared in the system.
Business rule	The registrar admin can only store clearance if all departmental approvals are received and there are no unresolved issues.
Assumptions	The registrar admin has access to all relevant clearance information and system permissions to store the clearance status.

Table 17: store staff clearance use case descripton

Use case ID	UC-12
Use case Name	Deactivate user account

Description	The system administrator deactivates user accounts of academic staff or other personnel who no longer require system access, without deleting their data.
Goal	Allow the system administrator to temporarily or permanently deactivate user accounts that are no longer active or authorized to use the system.
Actors	System admin
Pre condition	The system admin is logged into the system with the necessary privileges to manage user accounts.
Main flow	1. The system admin navigates to the user management section. 2. The admin searches for the user account to be deactivated. 3. The system displays the user's profile and account status. 4. The admin selects the "Deactivate Account" option. 5. The system prompts for confirmation. 6. The admin confirms deactivation. 7. The system deactivates the account and revokes all system access for the user.
Alternative flow	If the user is involved in ongoing processes (e.g., active clearance or asset handover), the system displays a warning and prevents deactivation until those processes are completed.
Post condition	The user account is deactivated; the user can no longer log in, but their data remains stored in the system for auditing and record-keeping.

Business rule	1. User accounts may only be deactivated if the user has no pending obligations. 2. Deactivated accounts can be reactivated by an authorized admin if necessary.
Assumptions	1. The system admin verifies that the account is eligible for deactivation. 2. The deactivation is logged for audit purposes.

Table 18: deactivate user account use case description

Use case ID	UC-13
Use case Name	Download and Print clearance certificate
Description	This use case allows an academic staff member or university administrator to download the Final Clearance Certificate in PDF format and print a hard copy after all necessary final clearance approvals have been obtained.
Goal	To allow the academic staff member or administrator to download and print the Final Clearance Certificate once all final clearance conditions have been met and approved.
Actors	Academic Staff Member ,Administrator
Pre condition	1. The academic staff member must have completed all required obligations. 2. The Final Clearance must be approved by all relevant departments. 3. The staff member must have system access.

Main flow	1. The academic staff member logs into the system.
	2. The system verifies credentials and checks clearance status. 3. The user selects the Download and Print option. 4. The user clicks Download or Print**.**
Alternative flow	1. If the Print button is clicked, the system directly opens the print dialog box. 2. If clearance is not approved, the system displays an error.
Post condition	1. The Final Clearance Certificate is downloaded and/or printed successfully. 2. A digital copy is saved locally. 3. A printed copy is available for official use.
Business rule	1. The Final Clearance Certificate is generated only after all clearance conditions are met. 2. Only authorized users can download or print the certificate. 3. The document must be in PDF format, read-only.
Assumptions	1. The user has access to a printer. 2. The system supports PDF generation. 3. The system ensures the certificate is accurate and secure. 4. The user has the appropriate permissions to perform the action.

Table 19: download and print clearance certificate use case description

Use case ID	UC-14

Use case Name	Check Assets Return or Issue Resolution
Description	Different departments can manually check if staff have returned assets or resolved any issues (e.g., financial or credit affairs) before approving them as cleared or notifying them as not cleared.
Goal	Ensure proper management of assets returns and issue resolutions through manual verification.
Actors	Librarians, Finance, Student Dean, Saving and Credit Association, Property Executive Directorate
Pre condition	Users must have valid credentials and access to the manual management system for materials and issues.
Main flow	1. User logs into the system. 2. User navigates to the assets return or issue resolution section. 3. User selects the option to check the return status of materials or the resolution status of issues. 4. User manually verifies whether the staff member has returned the assets or resolved the issue. 5. If the asset is returned or the issue is resolved, the user marks the staff member as cleared.

	6. System updates the records accordingly.
Alternative flow	1. If the asset is not returned or the issue is not resolved, the user may suggest steps for resolution. 2. If the user decides not to proceed with marking the status, the system returns to the previous screen.
Post condition	User successfully checks the return status of assets or the resolution of issues, and the system updates the records, marking the staff member as cleared or not cleared as appropriate.
Business rule	The system must ensure accurate tracking of asset returns and issue resolutions, with manual verification required for clearance.
Assumptions	Users are familiar with the asset management system and have the necessary permissions to check or issue assets.

Table 20: check asset return or issue resolution use case description

2.5.3. State Chart diagram

Create Account state chart diagram[4]

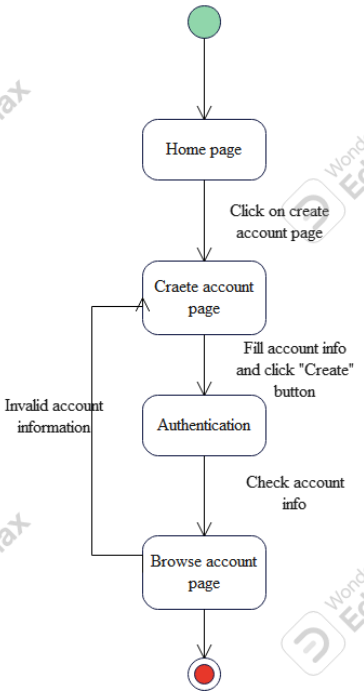

Figure 2: create account state chart diagram

Login State Chart diagram

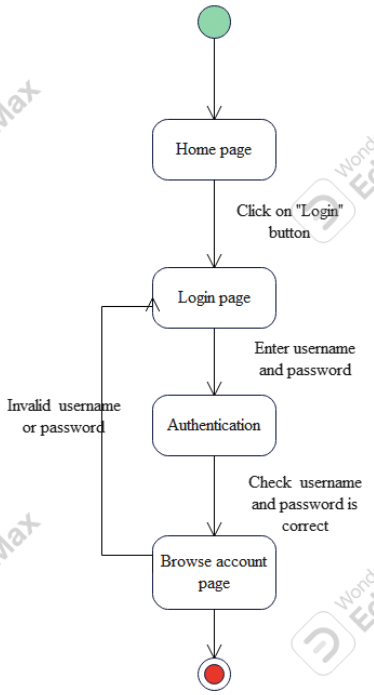

Figure 3: Login State Chart diagram

Search State Chart diagram

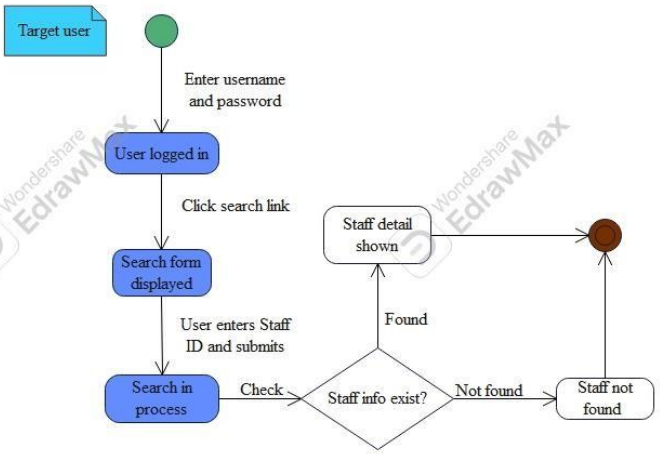

Figure 4: search State Chart diagram

Search State Chart diagram

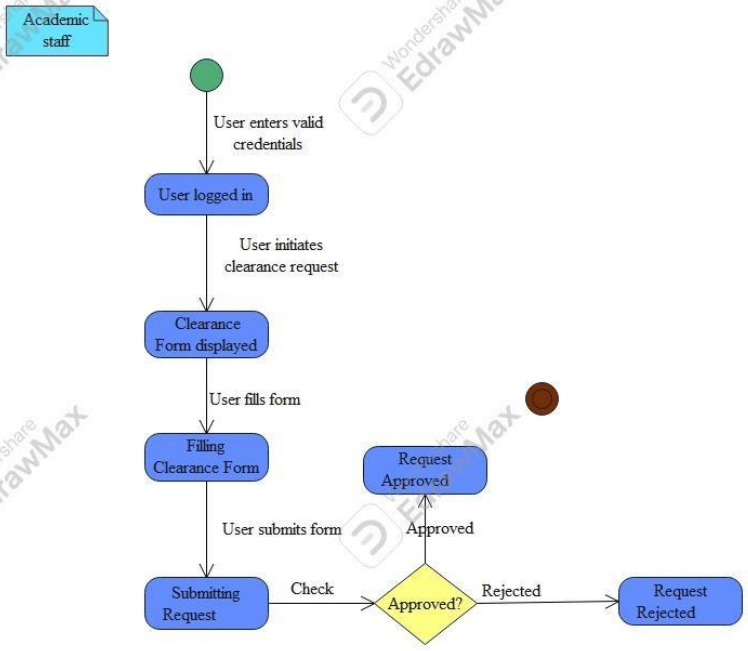

Figure 5: clearance request state chart diagram

2.5.4. Activity diagram

Activity diagram for create account

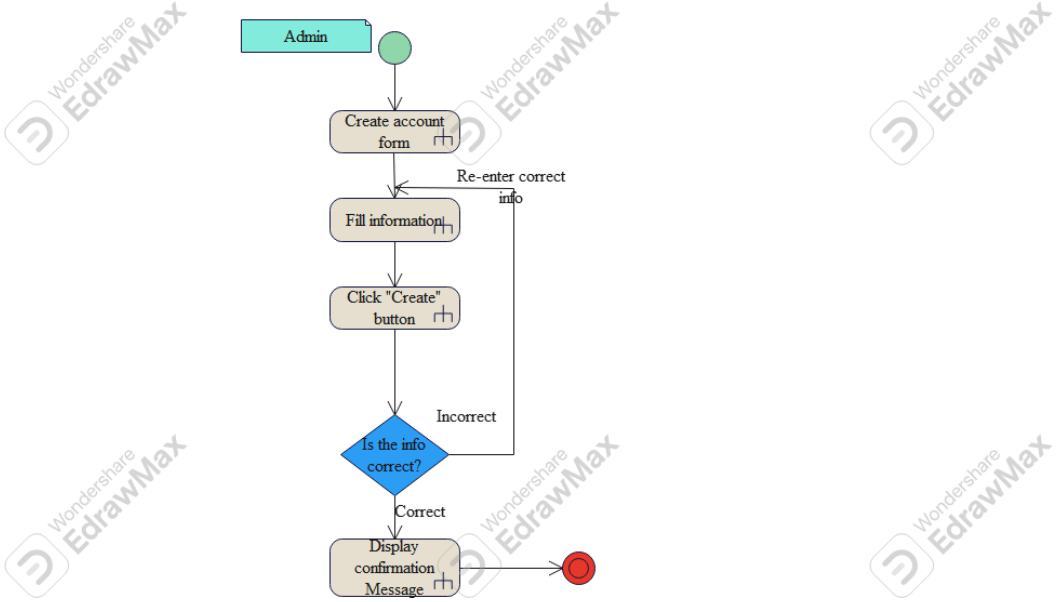

Figure 6: activity diagram for create account

Activity diagram for login

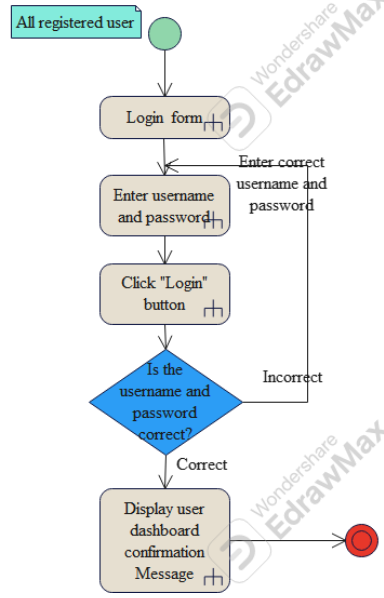

Figure 7: activity diagram for login

Activity diagram for clearance request

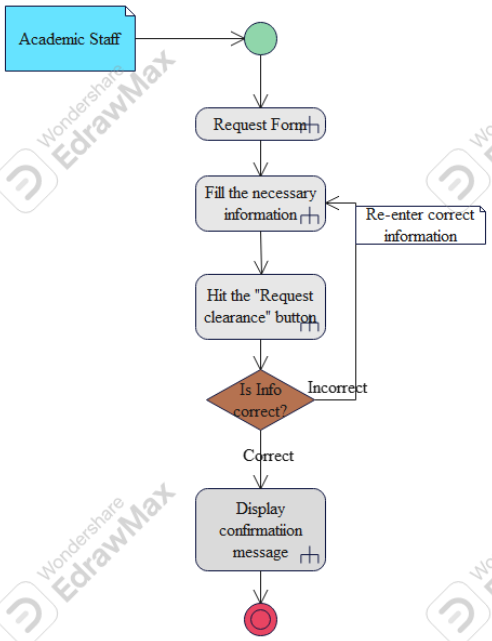

Figure 8: activity diagram for clearance request

Activity diagram for Search

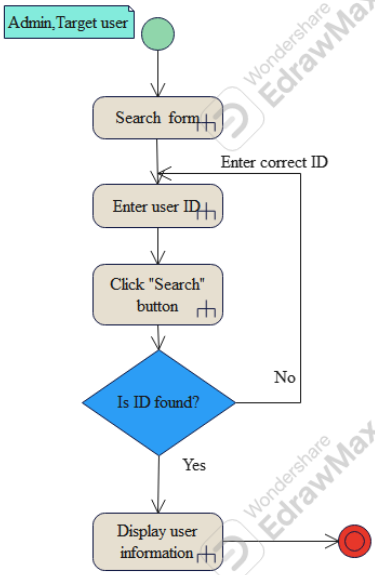

Figure 9: activity diagram for search

Activity diagram for Update profile

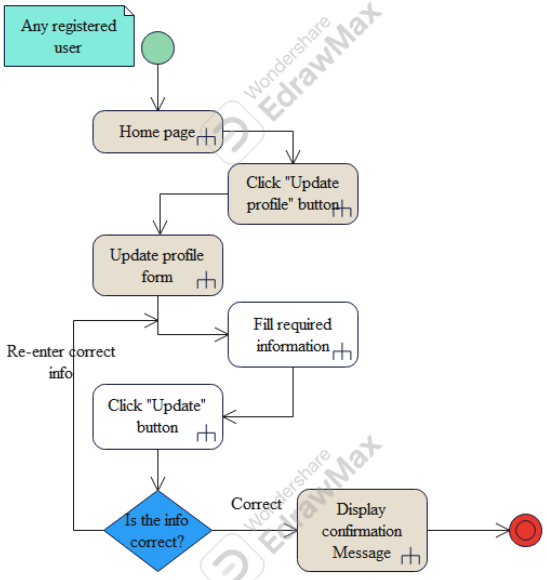

Figure 10: activity diagram for update profile

2.5.5. Sequence diagram

Sequence diagram for Create account

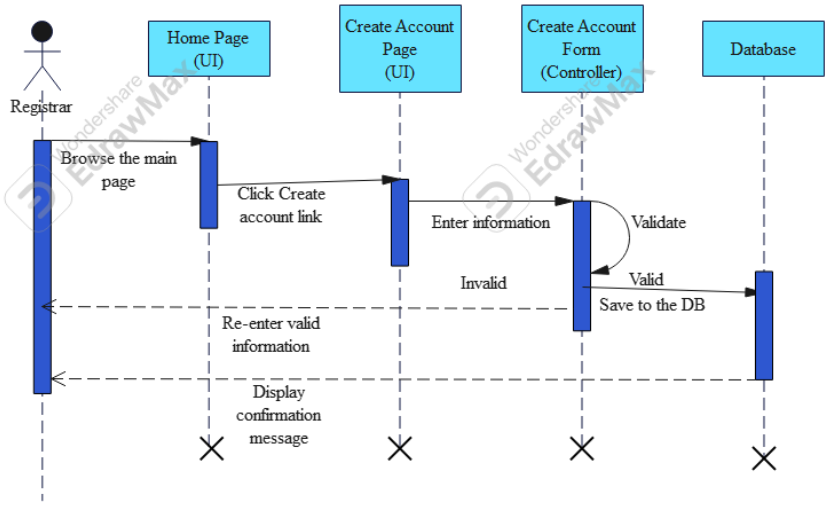

Figure 11: sequence diagram for create account

Sequence diagram for Login

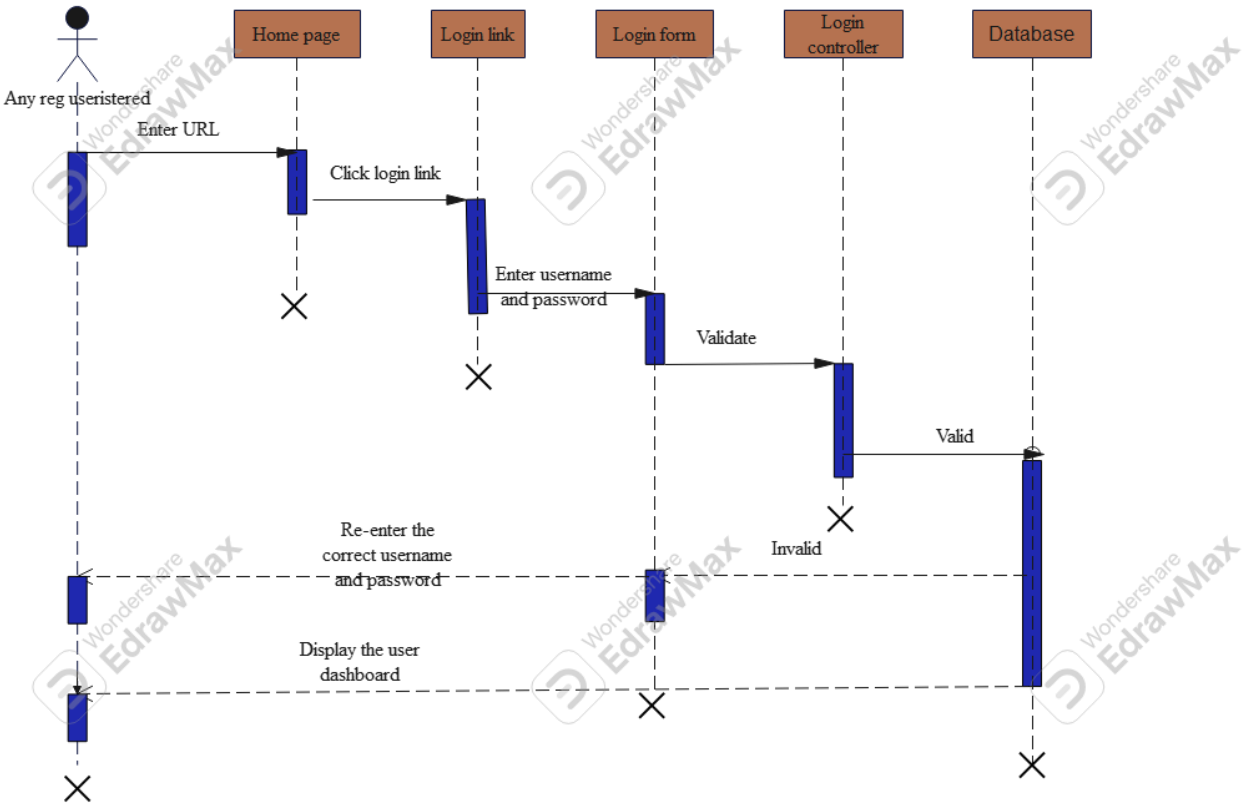

Figure 12: sequence diagram for login

Sequence diagram for Update Profile

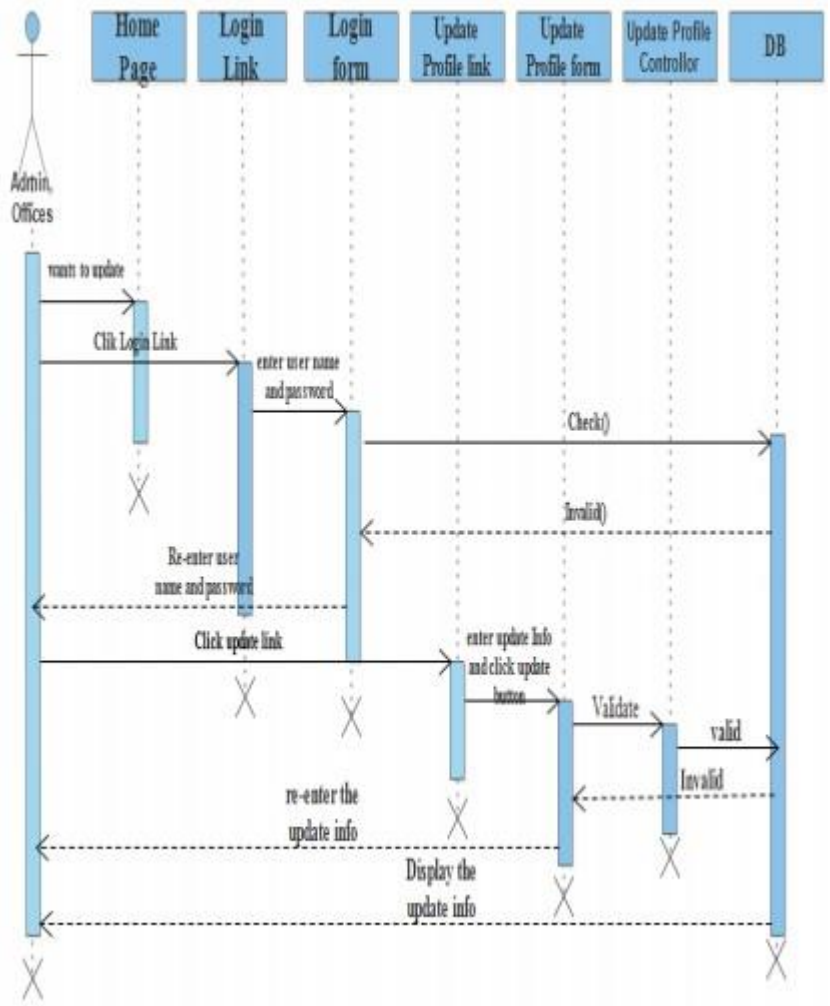

Figure 13: sequence diagram for update profile

Sequence diagram for Generate Report

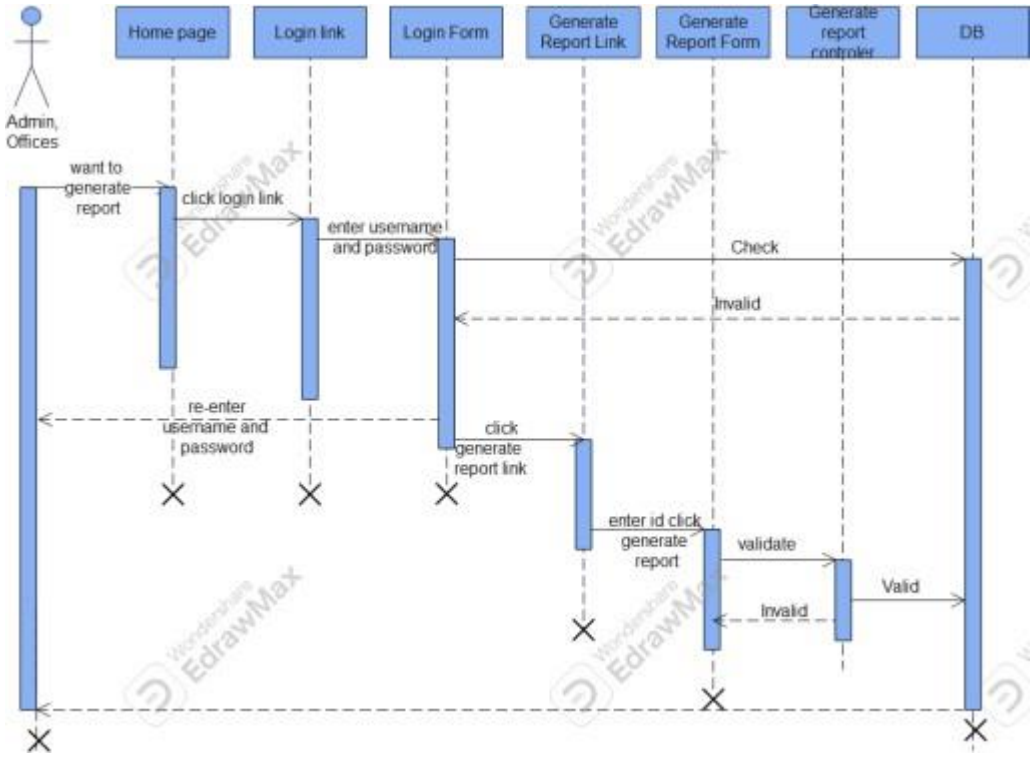

Figure 14: sequence diagram for generate report

Search Sequence diagram

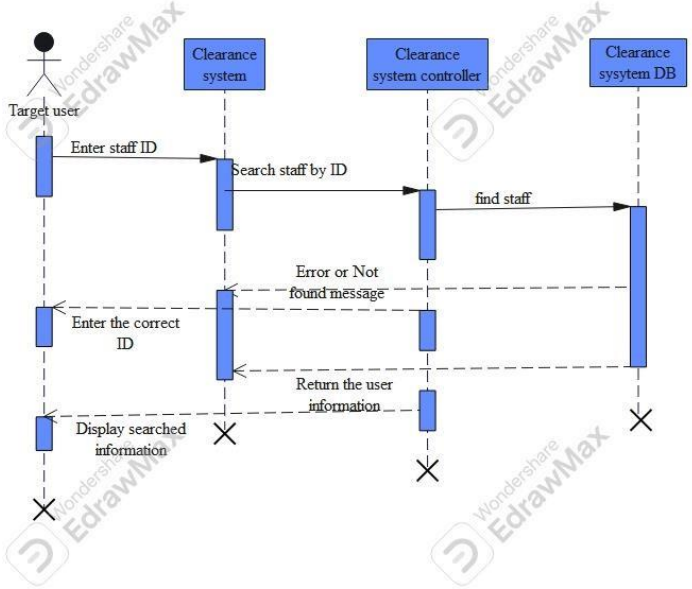

Figure 15: search sequence diagram

2.5.6.Collaboration diagram

Collaboration diagram for Create Account

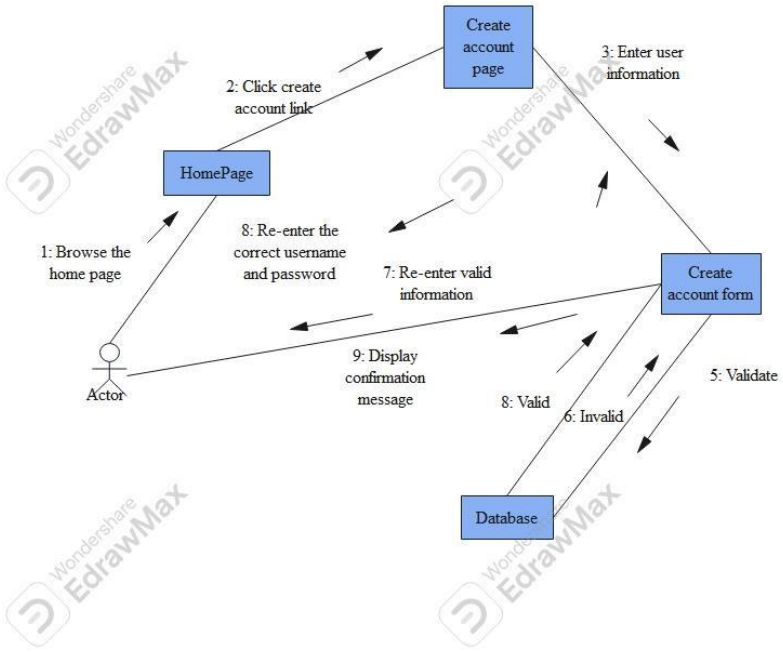

Figure 16: collaboration diagram for Create Account

Collaboration diagram for Login

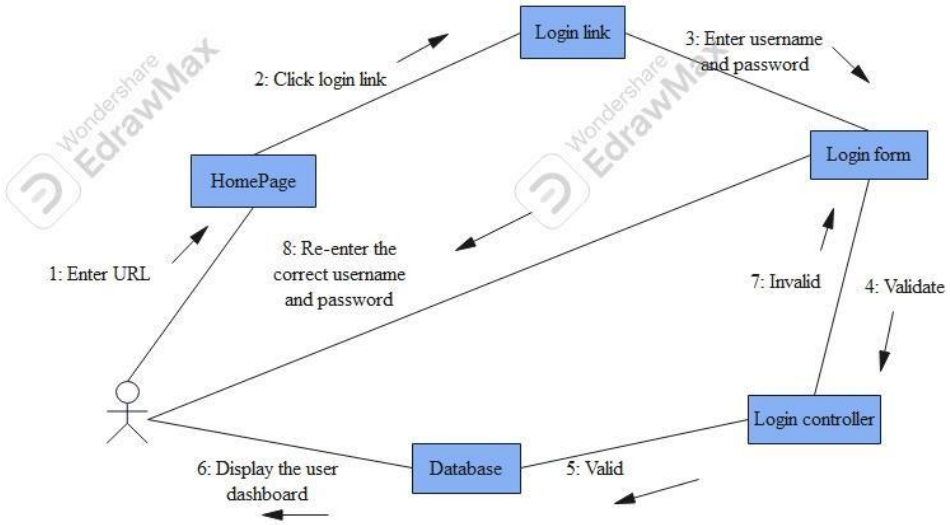

Figure 17: Collaboration diagram for login

Collaboration diagram for Search

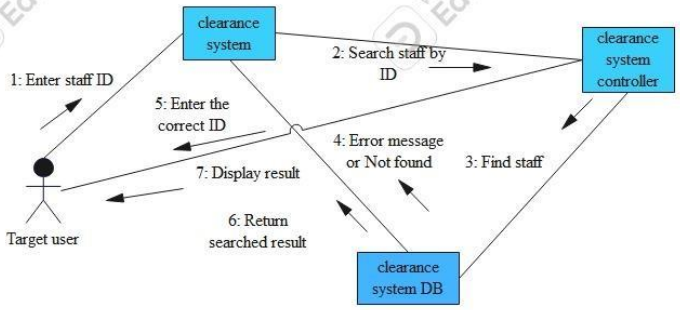

Figure 18: collaboration diagram for search

Collaboration diagram for search

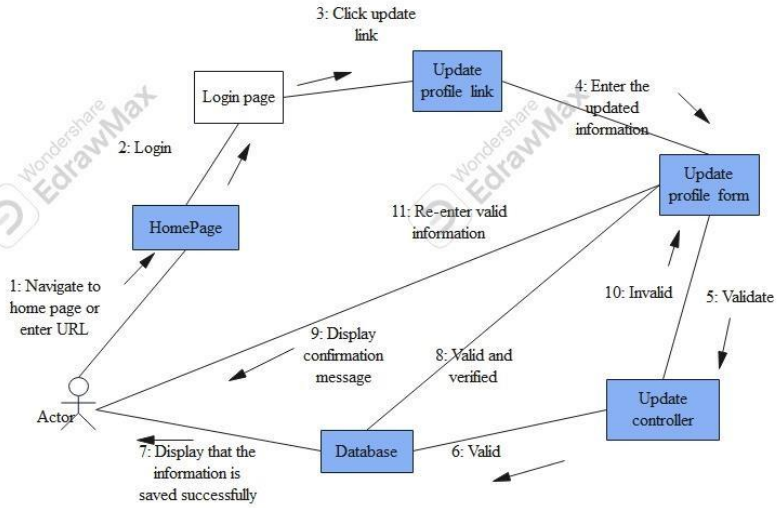

Figure 19: collaboration diagram for update profile

2.5.6. Class diagram

Class diagram for proposed system is given as follows:

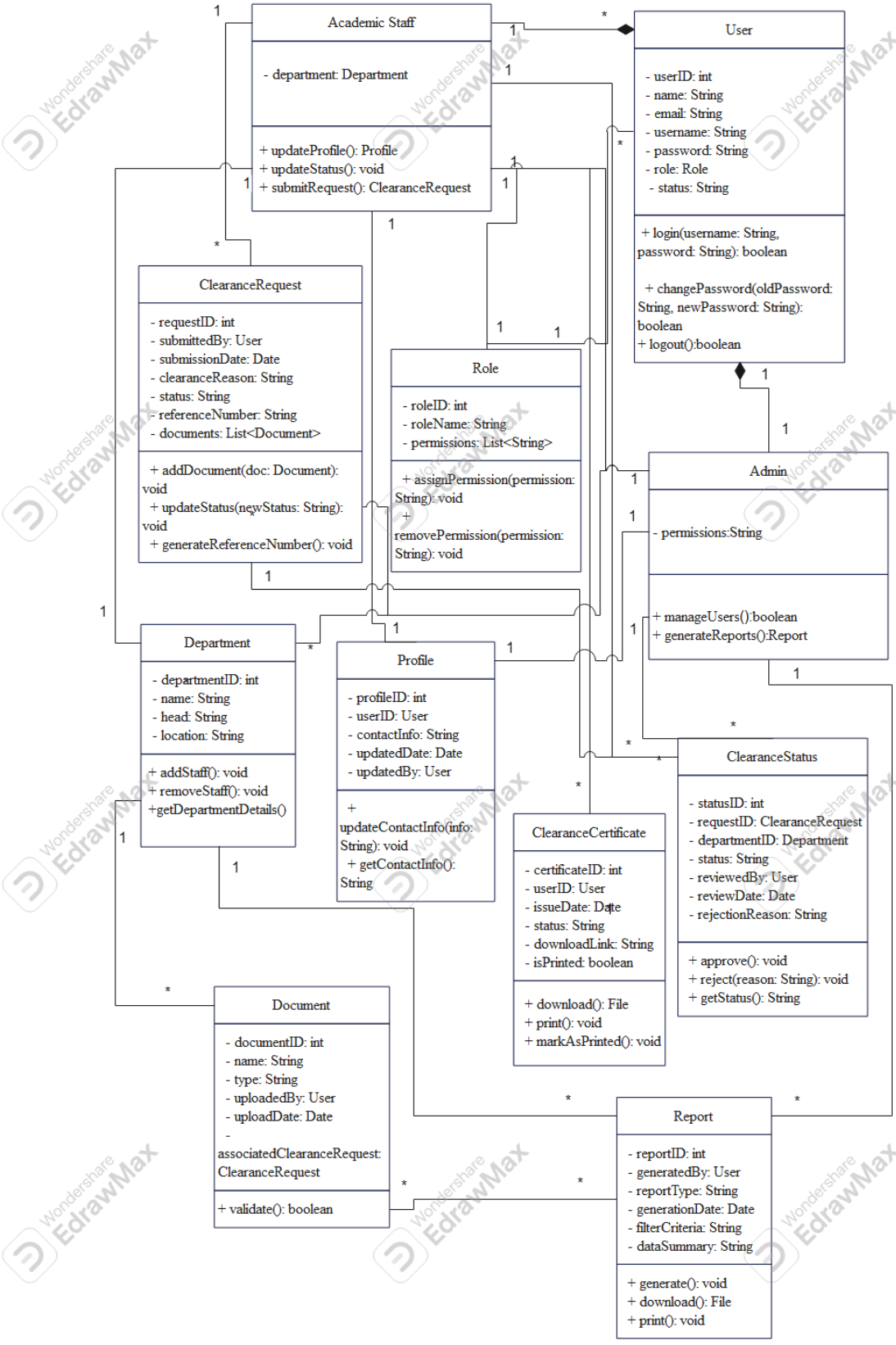
Academic Staff
- department: Department
+ updateProfile(): Profile
+ updateStatus(): void
+ submitRequest(): ClearanceRequest
User
- userID: int
- name: String
- email: String
- username: String
- password: String
- role: Role
- status: String
+ login(username: String, password: String): boolean
+ changePassword(oldPassword: String, newPassword: String): boolean
+ logout():boolean
ClearanceRequest
- requestID: int
- submittedBy: User
- submissionDate: Date
- clearanceReason: String
- status: String
- referenceNumber: String
- documents: List<Document>
+ addDocument(doc: Document): void
+ updateStatus(newStatus: String): void
+ generateReferenceNumber(): void
Role
- roleID: int
- roleName: String
- permissions: List<String>
+ assignPermission(permission: String): void
+ removePermission(permission: String): void
Admin
- permissions:String
+ manageUsers():boolean
+ generateReports():Report
Department
- departmentID: int
- name: String
- head: String
- location: String
+ addStaff(): void
+ removeStaff(): void
+getDepartmentDetails()
Profile
- profileID: int
- userID: User
- contactInfo: String
- updatedDate: Date
- updatedBy: User
+ updateContactInfo(info: String): void
+ getContactInfo(): String
ClearanceStatus
- statusID: int
- requestID: ClearanceRequest
- departmentID: Department
- status: String
- reviewedBy: User
- reviewDate: Date
- rejectionReason: String
+ approve(): void
+ reject(reason: String): void
+ getStatus(): String
ClearanceCertificate
- certificateID: int
- userID: User
- issueDate: Date
- status: String
- downloadLink: String
- isPrinted: boolean
+ download(): File
+ print(): void
+ markAsPrinted(): void
Document
- documentID: int
- name: String
- type: String
- uploadedBy: User
- uploadDate: Date
- associatedClearanceRequest: ClearanceRequest
+ validate(): boolean
Report
- reportID: int
- generatedBy: User
- reportType: String
- generationDate: Date
- filterCriteria: String
- dataSummary: String
+ generate(): void
+ download(): File
+ print(): void

Figure 20: class diagram

Chapter Three: System Design

3.1. Design goals

The design goals for the Academic Staff Online Clearance System aim to ensure a streamlined, efficient, and secure clearance process tailored to the needs of academic staff at Woldia University. The system is developed with a focus on performance, maintainability, user experience, reliability, and security [4].

3.1.1. Performance Criteria

Fast Processing

- Clearance requests should be processed in real-time or within 5 seconds for typical operations, such as submitting forms or updating statuses.
- The system should ensure minimal delays, even under high user traffic during peak periods, such as semester closures.

Scalability

- The system should support at least 500 concurrent users without performance degradation and should be scalable to accommodate future growth.

Optimized Resource Utilization

- The application should optimize server resource usage to minimize costs while maintaining responsiveness.

Peak Load Handling

- The system must effectively handle spikes in traffic without downtime, especially during end-of-term clearance periods or mass staff resignations.

3.1.2. Maintenance Criteria

Ease of Updates

- The system should be built in a way that lets developers update parts of it like changing workflow rules or user roles without affecting the rest of the system.

Documentation

- There should be complete and clear guides that explain how the system is built, how user roles work, how the clearance process flows, and how to fix common problems. This will make maintenance easier.

Adaptability

- The system should make it easy to add new clearance departments, change the clearance steps, or update rules, without needing major changes to the system's main structure.

Monitoring and Alerts

- The system should have tools to watch for problems and send early warnings if there are performance issues or security risks, so they can be fixed quickly.

3.1.3. End User Criteria

User Friendly Interface

- Provide a clean and intuitive interface for academic staff, clearance officers, and administrators to perform their tasks with minimal effort.

Mobile and Cross-Platform Support

- Ensure the system is accessible on various devices, including smartphones, tablets, and desktops, through a responsive design.

Self-Service Features

- Academic staff should be able to independently initiate clearance requests, track progress, and view notifications.

Minimal Training

- The system should require minimal training for all users, with clear prompts and help guides embedded in the platform.

Personalized Dashboards

- Users should have personalized dashboards showing pending tasks, progress updates, and deadlines.

3.1.4. Reliability Requirement

High Availability

- Ensure the system achieves at least 99.5% uptime, excluding scheduled maintenance.

Data Integrity

- All transactions, such as form submissions and approvals, should be fully completed or rolled back in case of an error (atomic transactions).

Daily Backups

- Implement automated daily backups to prevent data loss in case of system failure or cyber-attacks.

Error Recovery

- The system should include mechanisms for automatic recovery from crashes with minimal disruption to users.

Consistent Performance

- Ensure the system functions consistently across different network speeds and hardware configurations.

3.1.5. Security Requirement

Authorization and Authentication

Enforce secure login mechanisms, such as strong password policies and role-based access control (RBAC), to ensure users access only what they are authorized to view or edit.

Data Encryption

- Encrypt all sensitive data during storage and transmission (in transit) using robust encryption protocols like AES and TLS.

Activity Monitoring and Logging

- Maintain logs of user activities for audit purposes and to detect suspicious activities, ensuring compliance with university policies.

Security Audits

- Regularly conduct security audits to identify and address vulnerabilities promptly.

Incident Response

- Establish protocols to respond to security incidents, such as breaches, within a defined timeframe to minimize damage.

3.2. System Architecture

The Academic Staff Online Clearance System adopts a three-tier architecture to separate concerns and improve scalability and maintainability [9].

Presentation Layer

Provides the user interface for academic staff, clearance officers, and administrators. Built using web technologies (React.js).

Application Layer (Business Logic)

Contains the logic for managing clearance requests, validation, approvals, notifications, and report generation. Implemented using server-side technologies (Node.js).

Data Layer

Handles database interactions, stores clearance records, user profiles, department lists, and logs. Uses a relational database (MySQL).

3.3. Subsystem Decomposition

To ensure clarity, modularity, and ease of development, the system is divided into several well-defined subsystems. Each subsystem focuses on a specific area of functionality, promoting maintainability, scalability, and efficient teamwork. The major subsystems are described as follows [7]:

User Management Subsystem

The User Management Subsystem is responsible for handling all activities related to user identity and access control. The responsibilities are:

- User Registration: Allows new users, such as academic staff, clearance officers, and administrators, to create accounts.
- Authentication: Provides secure login mechanisms, verifying user credentials.
- Role Management: Assigns roles to users based on their position (e.g., academic staff, clearance officer, admin), determining their access rights within the system.
- Profile Management: Enables users to update their personal information, such as email addresses and contact details.
- Account Recovery: Supports password reset and account recovery options through secure methods like email verification.

Clearance Management Subsystem

The Clearance Management Subsystem oversees the core business process of academic staff clearance. Its major responsibilities are:

- Clearance Request Initiation: Allows academic staff to initiate clearance requests by submitting necessary forms and documents.
- Clearance Progress Tracking: Enables both the requester and officers to view the status and history of the clearance process.

- Approval Workflow: Facilitates sequential or parallel approvals from various departments.
- Completion and Archiving: Marks clearance requests as completed once all departments have approved and archives them for future reference.
- Issue Management: Handles issues such as rejected requests or requests requiring additional information.

Notification Subsystem

The Notification Subsystem is designed to improve communication and user engagement by providing timely updates regarding clearance processes. Its responsibilities include:

- Web push notifications: Displays real-time alerts within the system interface regarding status changes, approvals, or additional requirements.

Reporting Subsystem

The Reporting Subsystem is essential for providing insights into system usage and operational efficiency. Its functionalities include:

- Clearance Reports: Generates detailed reports of clearance requests, their statuses, departmental involvement, and timelines.
- Audit Logs: Records all critical user actions, such as approvals, rejections, and account modifications, to support accountability and compliance.
- Export Options: Allows reports and logs to be exported in formats like PDF, Excel, or CSV for external analysis and record-keeping.

Security Subsystem

The Security Subsystem provides a robust foundation for protecting the system and user data from unauthorized access and breaches. Its main responsibilities are:

- Authentication and Authorization: Ensures that only authenticated users can access the system and enforces role-based access controls.
- Data Encryption: Encrypts sensitive data at rest and in transit, safeguarding personal and institutional information.
- Activity Monitoring: Tracks suspicious activities and login attempts, triggering alerts for potential security threats.

- Security Audits: Facilitates periodic security checks and system hardening to prevent vulnerabilities.

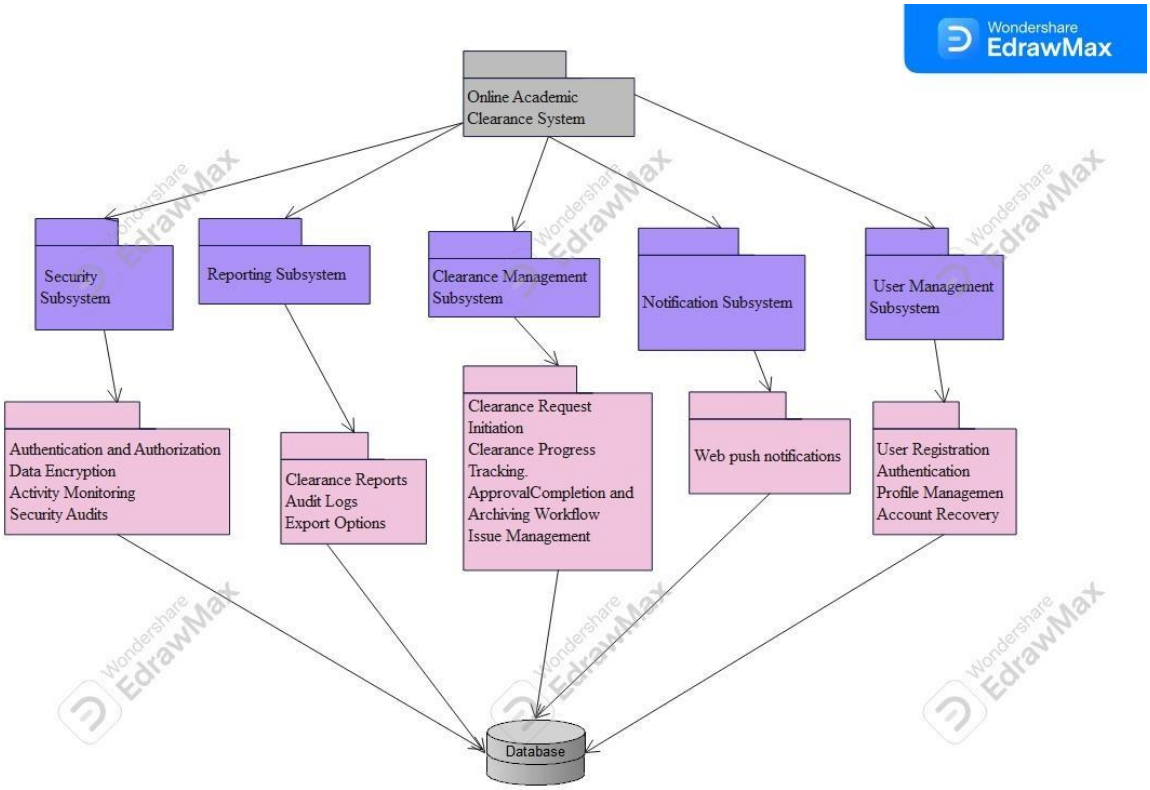

Figure 21: subsystem architecture diagram

3.4. Component Modeling

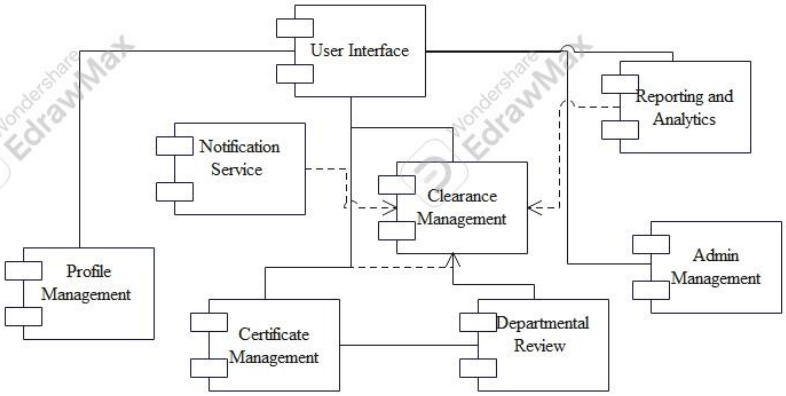

Figure 22: component diagram

3.5. Deployment Modeling

In our Academic Staff Clearance System at Woldia University, deployment modeling outlines how the various software components such as the User Interface Component, Clearance Management Component, and Database components are deployed across different physical machines or cloud services. It also addresses issues like network architecture, server configurations, and any communication between device[8].

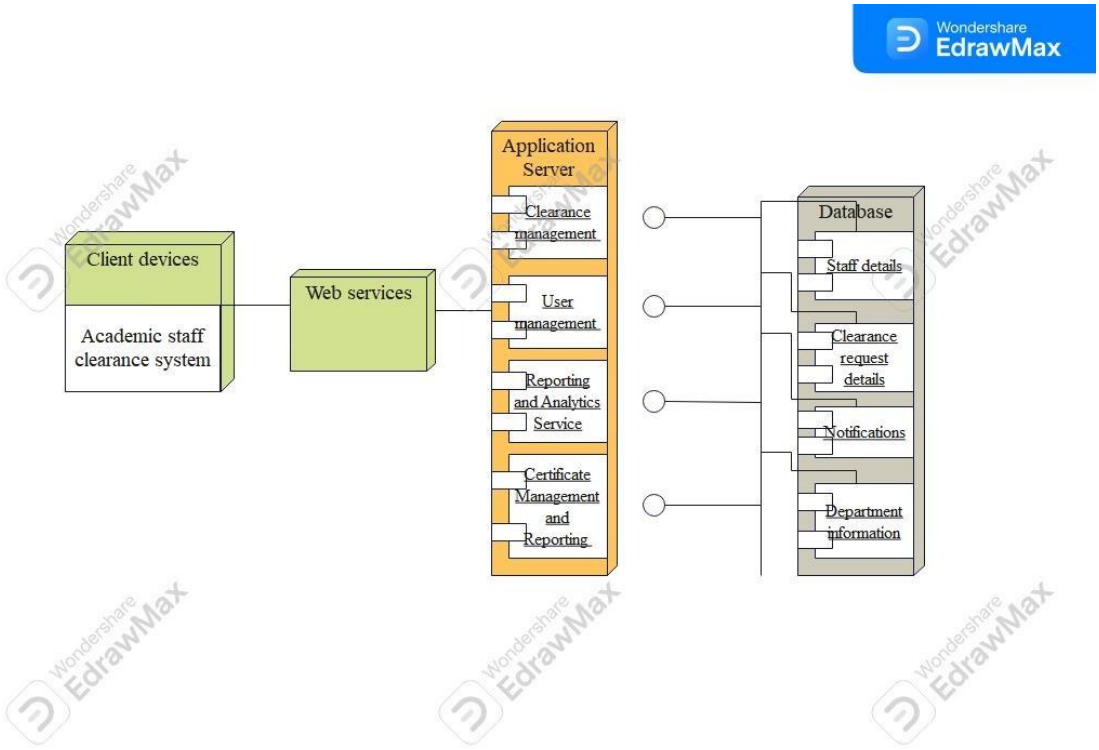

Figure 23: Deployment diagram

3.6. Database Design

Database design for our system is as follows:

Database Entities, Attributes, and Data Types

- **Academic Staff**

Attribute	Data Type	Description
✓ Staff ID (PK)	INT (Auto Increment)	Unique ID for each academic staff.
✓ FirstName	VARCHAR (50)	Staff first name.
✓ LastName	VARCHAR (50)	Staff last name.
✓ Email	VARCHAR (100)	Staff email address.
✓ Phone	VARCHAR (20)	Staff phone number.
✓ Department	VARCHAR (100)	Staff department name.
✓ Position	VARCHAR (50)	Staff job title or rank.

- ✓ EmploymentStatus VARCHAR (30) Status (Active, Retired, Transferred.).
- ✓ Profile Picture VARCHAR (255) Path to profile picture

- **Clearance Request**

Attribute	Data Type	Description
✓ Request ID (PK)	INT (Auto Increment)	Unique ID for each clearance request.
✓ StaffID (FK)	INT	Reference to AcademicStaff.StaffID.
✓ RequestDate	DATE	Date of request submission.
✓ ReasonForClearance	VARCHAR (100)	Reason (e.g., Retirement, Transfer).
✓ Current Status	VARCHAR (30)	Current processing status.
✓ FinalApprovalStatus	VARCHAR (30)	Final approval status.
✓ CertificatePath	VARCHAR (255)	File path to clearance certificate PDF.

- **Department**

Attribute	Data Type	Description
✓ Department ID (PK)	INT (Auto Increment)	Unique ID for each department.
✓ DepartmentName	VARCHAR (100)	Department name.
✓ Contact Email	VARCHAR (100)	Department contact email.

- **Clearance Review**

Attribute	Data Type	Description
✓ ReviewID (PK)	INT (Auto Increment)	Unique ID for each clearance review.
✓ RequestID (FK)	INT	Reference to ClearanceRequest.RequestID.
✓ DepartmentID (FK)	INT	Reference to Department.DepartmentID.
✓ ReviewerID (FK)	INT	Reference to User.UserID.
✓ ReviewDate	DATE	Date of the review
✓ ReviewStatus	VARCHAR (30)	Review status (Pending, Cleared, Rejected).
✓ Comments	TEXT	Reviewer's comments.

- **User**

Attribute	Data Type	Description

- ✓ UserID (PK) INT (Auto Increment) Unique ID for each user.
- ✓ Username VARCHAR (50) Login username.
- ✓ PasswordHash VARCHAR (255) Encrypted password.
- ✓ Role ENUM ('Admin', 'Reviewer', 'AcademicStaff') User's role.
- ✓ Email VARCHAR (100) User's email address.
- ✓ Phone VARCHAR (20) Phone number.
- ✓ ProfilePicture VARCHAR (255) Path to profile picture.

➢ **Notification**

Attribute	Data Type	Description
✓ NotificationID (PK)	INT (Auto Increment)	Unique ID for each notification.
✓ ReceiverID (FK)	INT	Reference to User.UserID.
✓ Message	TEXT	Notification message content.
✓ NotificationType	ENUM (Browser Notifications)	Type of notification.
✓ SentDate	DATETIME	Date and time sent.

3.6.1. Design ER Diagram

An Entity-Relationship (ER) diagram for the clearance system is drawn as follows:

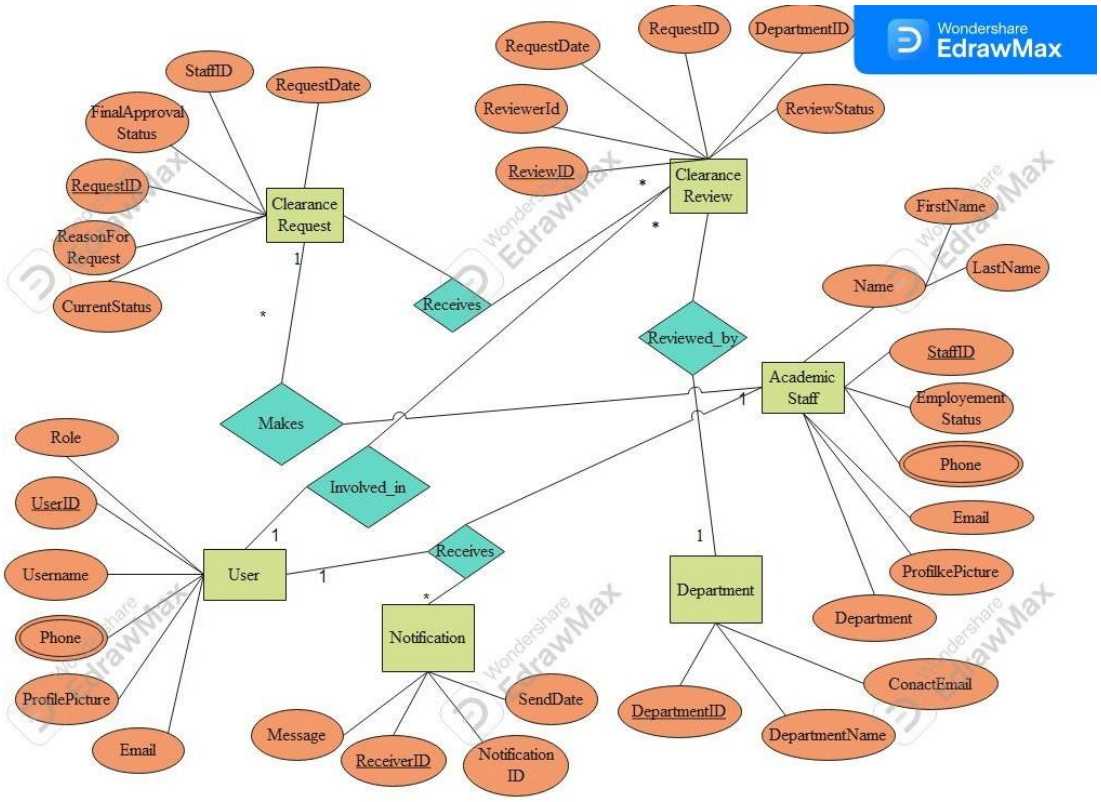

Figure 24: ER diagram

3.7. User interface Prototyping

User interface (UI) prototyping is the process of creating a preliminary visual model of a digital product's interface to explore design ideas, gather user feedback, and refine functionality before full development. Some of the user interface ptypes are given as the following samples:

Login form UI prototype

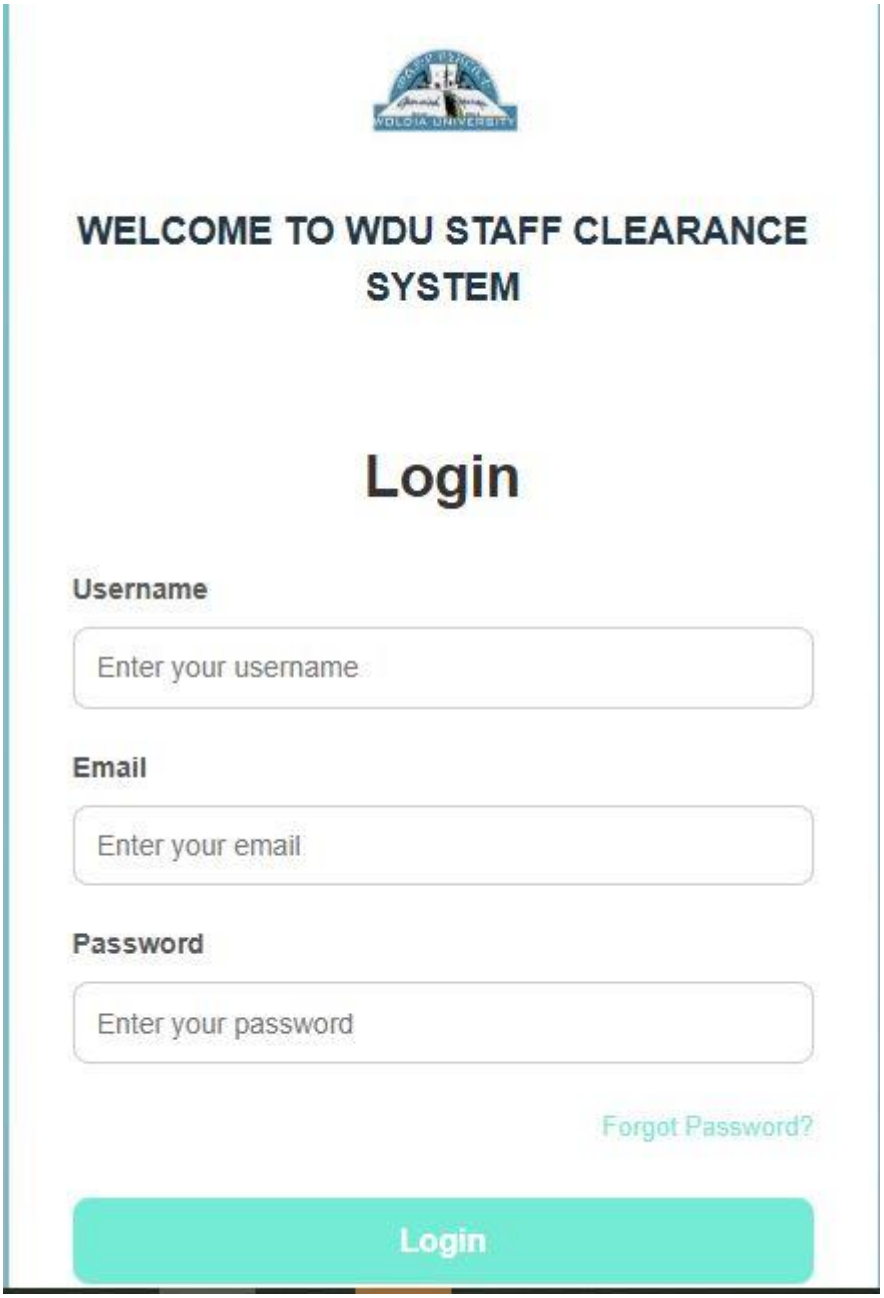

Figure 25: Login form UI prototype

Admin dashboard prototype

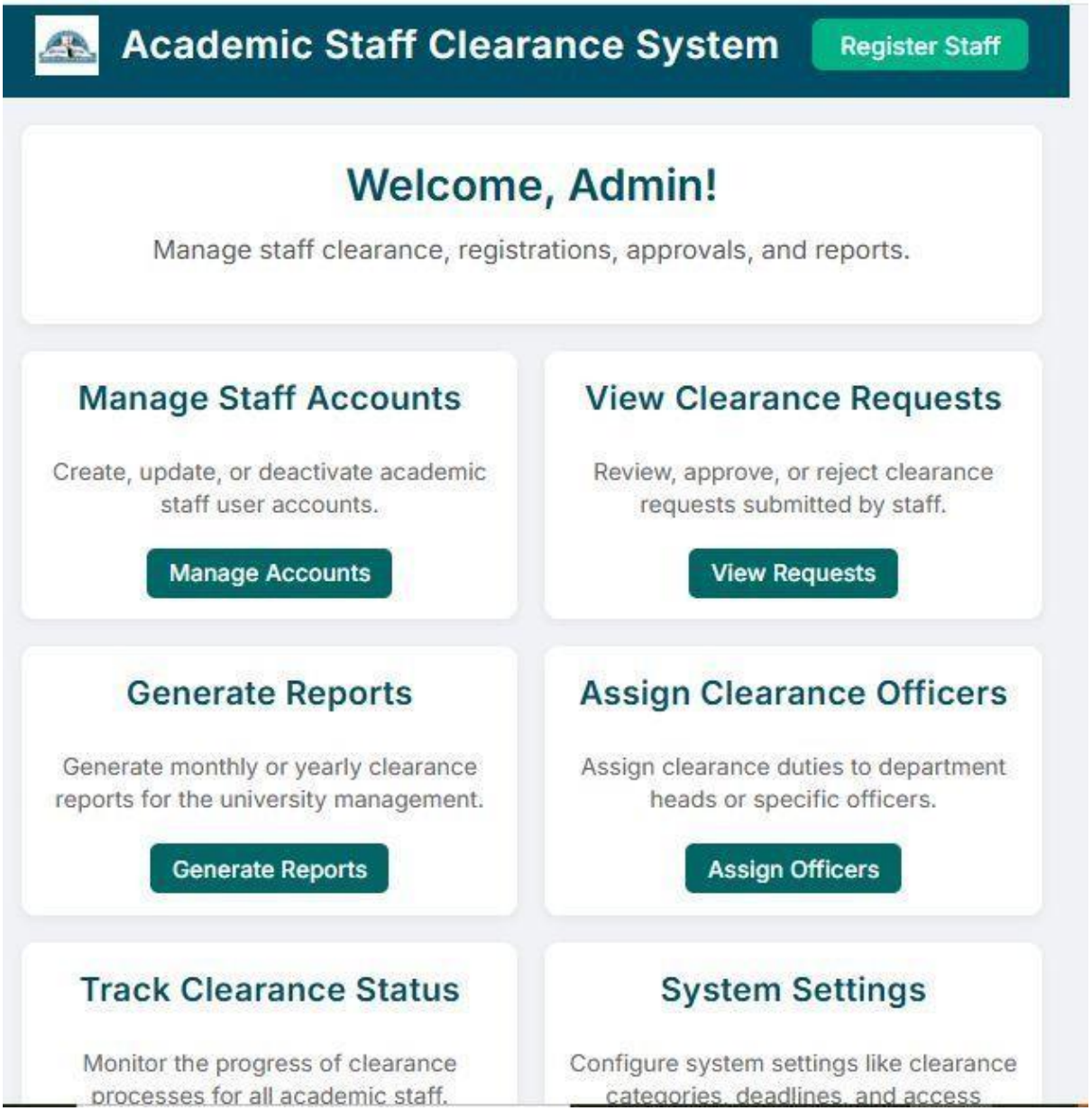

Figure 26: admin dashboard UI protype

Clearance Request UI protoype

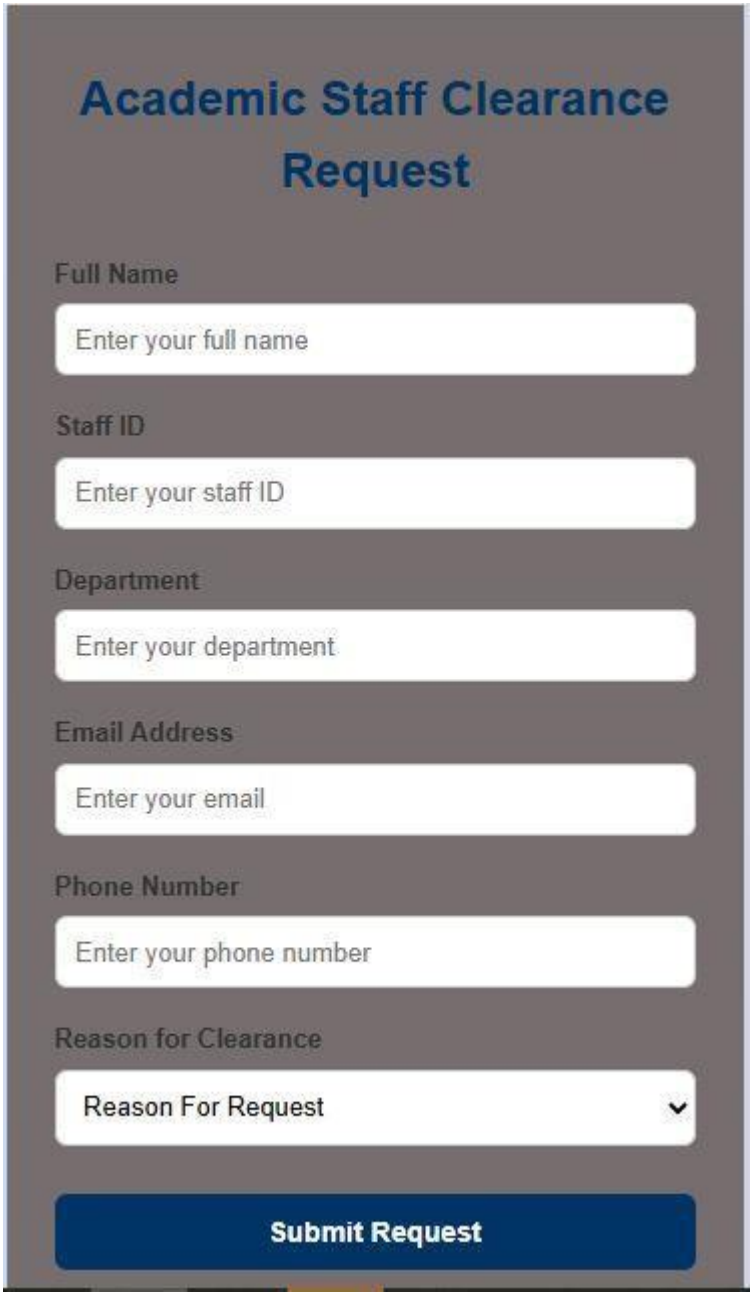

Figure 27: clearance request UI prototype

Library Issue Check UI prototype

Figure 28: library Issue check UI prototype

Change Password UI prototype

Figure 29: change password UI prototype

Reference

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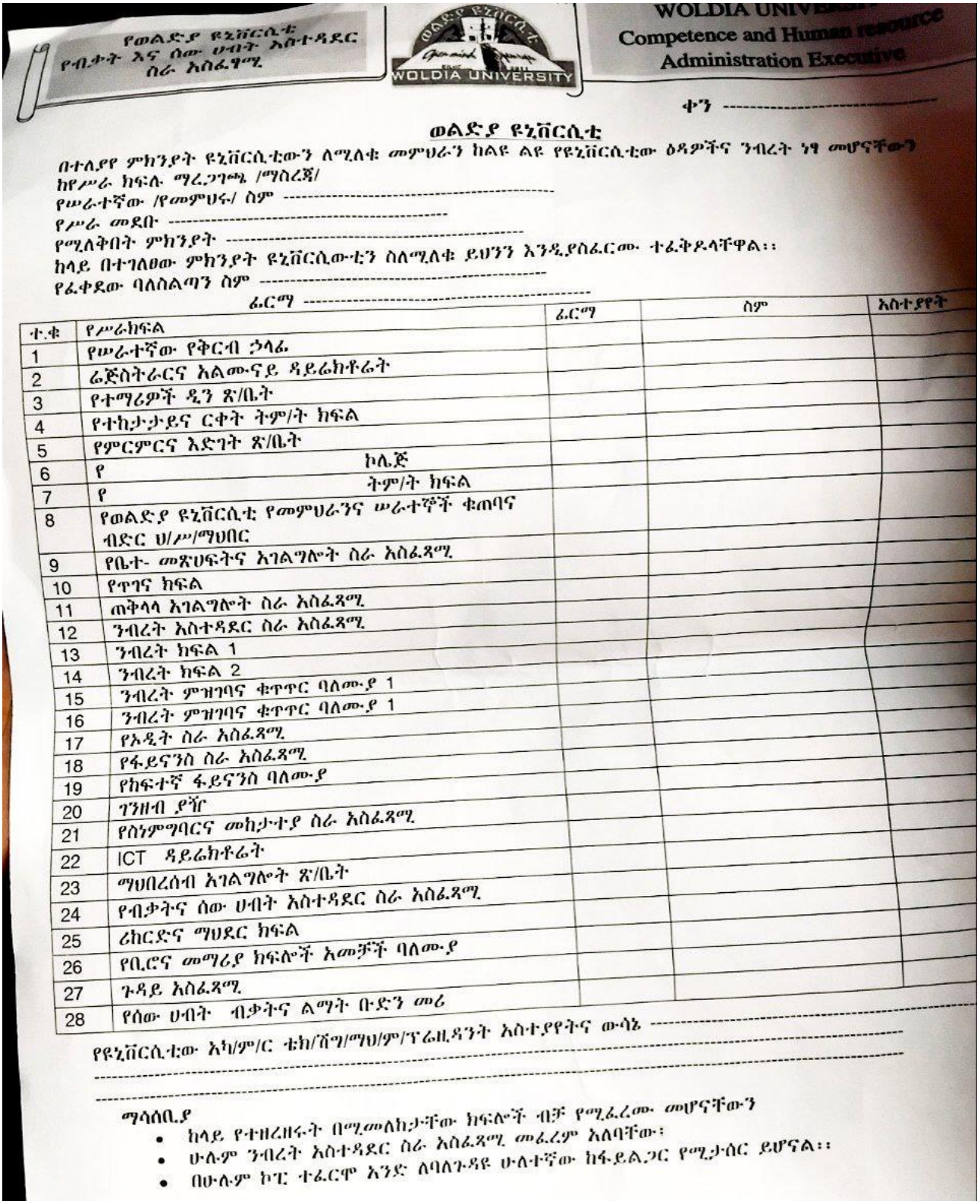
Appendix A

Existing Clearance Form



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የብቃት እና ሰው ሀብት አስተዳደር
ስራ አስፈጻሚ

WOLDIA UNIVERSITY

WOLDIA UNIVERSITY
Competence and Human resource
Administration Executive

ቀን ----------

ወልድያ ዩኒቨርሲቲ

በተለያየ ምክንያት ዩኒቨርሲቲውን ለሚለቁ መምህራን ከልዩ ልዩ የዩኒቨርሲቲው ዕዳዎችና ንብረት ነፃ መሆናቸውን ከየሥራ ክፍሉ ማረጋገጫ /ማስረጃ/

የሠራተኛው /የመምህሩ/ ስም ----------

የሥራ መደቡ ----------

የሚለቅበት ምክንያት ----------

ከላይ በተገለፀው ምክንያት ዩኒቨርሲውቲን ስለሚለቁ ይህንን እንዲያስፈርሙ ተፈቅዶላቸዋል፡፡

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ፊርማ ----------

ተ.ቁ	የሥራክፍል	ፊርማ	ስም	አስተያየት
1	የሠራተኛው የቅርብ ኃላፊ			
2	ሬጅስትራርና አልሙናይ ዳይሬክቶሬት			
3	የተማሪዎች ዲን ጽ/ቤት			
4	የተከታታይና ርቀት ትም/ት ክፍል			
5	የምርምርና እድገት ጽ/ቤት			
6	የ ኮሌጅ			
7	የ ት/ት ክፍል			
8	የወልድያ ዩኒቨርሲቲ የመምህራንና ሠራተኞች ቁጠባና ብድር ህ/ሥ/ማህበር			
9	የቤተ- መጽሀፍትና አገልግሎት ስራ አስፈጻሚ			
10	የጥገና ክፍል			
11	ጠቅላላ አገልግሎት ስራ አስፈጻሚ			
12	ንብረት አስተዳደር ስራ አስፈጻሚ			
13	ንብረት ክፍል 1			
14	ንብረት ክፍል 2			
15	ንብረት ምዝገባና ቁጥጥር ባለሙያ 1			
16	ንብረት ምዝገባና ቁጥጥር ባለሙያ 1			
17	የኦዲት ስራ አስፈጻሚ			
18	የፋይናንስ ስራ አስፈጻሚ			
19	የከፍተኛ ፋይናንስ ባለሙያ			
20	ገንዘብ ያዥ			
21	የስነምግባርና መከታተያ ስራ አስፈጻሚ			
22	ICT ዳይሬክቶሬት			
23	ማህበረሰብ አገልግሎት ጽ/ቤት			
24	የብቃትና ሰው ሀብት አስተዳደር ስራ አስፈጻሚ			
25	ሪከርድና ማህደር ክፍል			
26	የቢሮና መማሪያ ክፍሎች አመቻች ባለሙያ			
27	ጉዳይ አስፈጻሚ			
28	የሰው ሀብት ብቃትና ልማት ቡድን መሪ			

የዩኒቨርሲቲው አካ/ም/ር ቴክ/ሽግ/ማህ/ም/ፕሬዚዳንት አስተያየትና ውሳኔ ----------

ማሳሰቢያ

- ከላይ የተዘረዘሩት በሚመለከታቸው ክፍሎች ብቻ የሚፈረሙ መሆናቸውን
- ሁሉም ንብረት አስተዳደር ስራ አስፈጻሚ መፈረም አለባቸው፡
- በሁሉም ኮፒ ተፈርሞ አንድ ለባለጉዳዩ ሁለተኛው ከፋይሉጋር የሚታሰር ይሆናል፡፡