Software Requirements Specification for the ERP System of Chittagong University

Submitted to

University of Chittagong (CU)

Hathazari Upazila, Chittagong District, Bangladesh

Submitted by

Institute of Information Technology

UNIVERSITY OF DHAKA

August 2023

20 August, 2023

Vice Chancellor

University of Chittagong

Chittagong University Rd, Chittagong 4331

Subject: Letter of Transmittal

Sir,

With due respect, we, the requirements engineering team from Institute of Information Technology, University of Dhaka, are submitting to you the Software Requirements and Specifications (SRS) report for the automated Enterprise Resource Planning (ERP) system of Chittagong University (CU).

This SRS document describes in detail the requirements by the personnel of CU regarding the academic processes, identifies problems and risk factors latent in those processes, and proposes solutions to mitigate and prevent those issues through virtual and automated means.

We are thankful to your team for their persistent collaboration throughout the requirements collection process. And we thank you for your support in our endeavour.

Sincerely,

Dr. Kazi Muheymin-Us-Sakib

Project Head

Professor
Institute of Information Technology
University of Dhaka

Disclaimer

The analysis presented and proposed in this report are piloted to ensure they are consistent with Chittagong University's requirements. It should be noted that the requirements analyzed by this requirements engineering team are designed as a guide or reference during software development and hence can be shared with the software development team. This requirements engineering team will solely reserve the intellectual rights of the analysis.

For any query about this report, please contact:

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Team

The requirements analysis and specification project has been conducted by the requirement engineering team from Institute of Information Technology (IIT), University of Dhaka (DU). The team consists of the following members:

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1. Introduction

Chittagong University (CU) is laid upon 2312.32 acres of land housing 10 faculties and 54 departments and institutes. Along with academic activities the university maintains the administrative workflow employing 2046 non academic staffs. The university authority is responsible for an array of academic processes and crucial activities such as student admission and registration, exam management, result processing, marksheet/certificate preparation and more.

It is quite difficult and time-consuming to provide support to such an increasing number of students and activities with the current manual process of CU. Moreover, each process contains distinct features depending on the curriculum, making the system greatly expansive and notoriously dynamic. Adding to this, CU authority needs to maintain administrative processes like any other university.

Due to the manual process currently implemented, different inconsistencies, inefficiency, and risks arise while managing this huge number of students and administrative tasks through multiple dynamic processes, for example, security breaches, service integration failure, lessened maintainability, lack of efficiency and correctness, lack of data tracking etc.

So solve this issue, the CU authority designed a master plan visioning until 2050. Implementing this masterplan requires an efficient Enterprice Resource Planning (ERP) system as a prerequisite. This ERP system will eventually aid in administration and make processes efficient. This system is aimed to automate the crucial Chittagong University's processes, mainly encompassing academic and administrative activities, and to include their core personnel.

A rigorous requirements analysis is usually the first step to develop such a system. This Software Requirements and Specification (SRS) document contains the findings of that analysis after conducting communication with the stakeholders, field visit and problem domain analysis for identifying the limitations.

Objectives

Objectives of the requirements analysis are as follows:

1. Identifying the processes of the existing system
2. Identifying the limitations and risk factors of the existing system
3. Systematically analyzing and finding solutions for the identified problems or proposed solutions
4. Proposing an automated efficient system through incorporating the identified solutions

Scope

The scope of work to complete the contractual task is listed below:

- Provide an Inception Report proposing detailed scope of works, task breakdown, process methodology, deliverables and timeline to be followed.

- Propose the initial list of modules for the ERP and incorporate feedback regarding module list. After confirmation analyze each module's existing infrastructure.

- Survey requirements necessary to understand the responsibility of each module and design the ERP system. The requirements analyzed will be re-validated to incorporate updates and changes.

- Generate high level system design to estimate time and budget required for each system component alongside providing related external dependencies.

- The network and security design, hardware and manpower resources needed will be analyzed from the demographic information to estimate the budget.

- The final deliverable, the DPP is to be produced and validated from the first party

Methodology

The entire process is managed by - i) three core team members, ii) system analysis team, iii) DPP team, iv) and budgeting team. The following steps have been followed to accomplish the objectives and prepare this SRS document.

1. **Communication**: Successful projects require both internal and external communication as internal communication helps the team members to clarify conflicts and confusions about the project, and external communication helps to validate the correctness of the solution. More specifically, internal and external communication have been performed for discussing issues, managing conflicts, exchanging information, monitoring progress etc.

2. **Field Visit and Problem Domain Analysis**: Field visit is essential to communicate with the stakeholders and understand the current solution in the correct manner. However, it is the problem domain analysis step that enables one to define the area under analysis, fully understand the inputs and outputs of its processes, and achieve the goals of the area under analysis. Following actions have been done in this step.

    1. Identification of the goals and objectives of the system
    2. Understanding the existing process to address these goals
    3. Understanding the needs of the stakeholders
    4. Identifying gap analysis to determine the limitations
    5. Analyzing the identified limitations and needs
    6. Validating the limitations and needs with the stakeholders

3. **Solution Analysis**: The immediate next step to the problem domain analysis is the solution analysis. The goal of this step is to propose solutions to the identified problem in a modularized and manageable way. The actions conducted in this phase are as follows.

    1. Finding efficient solution to mitigate the identified limitations and fulfill the stakeholders' needs
    2. Proposing an automated system based on the solution
    3. Determining the modules in the system and identifying the interconnections among the modules
    4. Proposing a high level secured and adaptable architecture for the system
    5. System validation

4. **Documentation**: Upon the solution analysis, documentation has been done which acts as an input for further designing, development and maintenance of the solution in future. This SRS document acts as the findings of the requirements analysis process.

SRS Theory

The intent of the software requirement specification is to provide a description of the required informational, functional and behavioral domains for a system. It provides the appropriate mechanism for understanding what the customer wants, analyzing need, assessing feasibility, negotiating a reasonable solution, specifying the solution unambiguously, validating the specification and managing the requirements. It encompasses seven distinct tasks.

1. Inception: It is the beginning phase of requirements engineering. It defines how a software project gets started and what is the scope and nature of the problem to be solved. The goal of the inception phase is to identify concurrence needs and conflict requirements among the stakeholders of a software project.

2. Elicitation: Requirements Elicitation is a part of requirements engineering that is the practice of gathering requirements from the users, customers and other stakeholders. Many difficulties are faced, like understanding the problems, making questions for the stakeholders, limited communication with the stakeholders due to a short amount of time and volatility.

3. Elaboration: The information obtained from the customer during inception and elicitation is expanded and refined during elaboration. This task focuses on developing a refined requirements model that identifies various aspects of software function, behavior, and information.

4. Negotiation: It isn’t unusual for customers and users to ask for more than can be achieved, given limited business resources. It’s also relatively common for different customers or users to propose conflicting requirements, arguing that their version is termed as negotiation

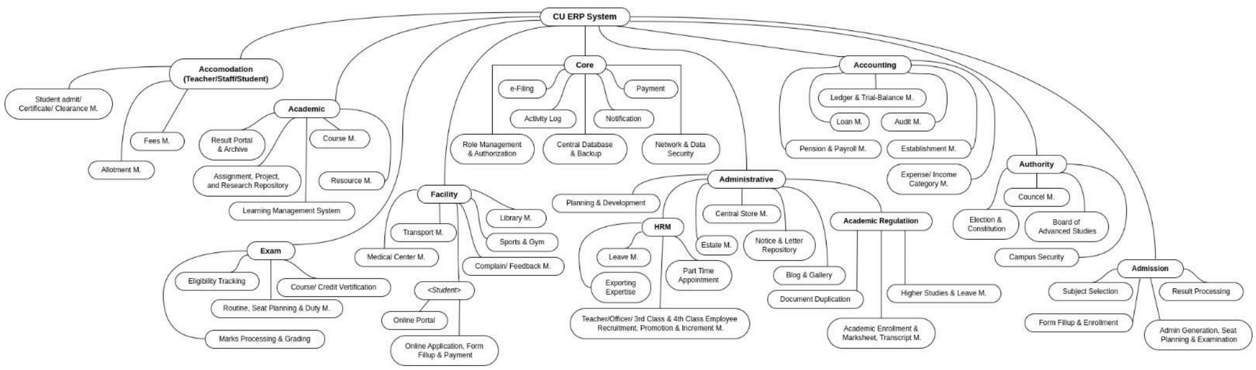
5. Specification: In the context of computer-based systems (and software), the term specification means different things to different people. A specification can be a written document, a set of graphical models, a formal mathematical model, a collection of usage scenarios, a prototype, or any combination of these.

6. Validation: The work products produced as a consequence of requirements engineering are assessed for quality during a validation step. Requirements validation examines the specification to ensure that all software requirements have been stated unambiguously.

7. Management: Requirements for computer-based systems change, and the desire to change requirements persists throughout the life of the system. Requirements management is a set of activities that help the project team identify, control, and track requirements and changes to requirements at any time as the project proceeds.

Proposed Solution

From this analysis, a few of the common problems, inconsistencies and risk factors of CU's manual processes were identified. Along with identification, solutions in the automated system were also proposed. The proposed modular hierarchy of the ERP system is demonstrated below:



This hierarchy is derived from requirements gathered from arranged meetings with the CU representatives of each administrative department. The requirements are elaborated on each of the respective sections in this SRS document. The core modules from the diagram are proposed to facilitate the proposed ERP system design. Moreover, these core modules can be reused to serve multiple purpose, for example, the e-Filing system can be reused in any office either internally or pass information externally through the desk pass subsection.

Organization of the Document

Following are chapter-wise overviews that work as a guideline for readers navigating the SRS document.

- **Chapter 2 | Inception**: In this chapter, an introduction to the CU's system is provided divided into modules. The academic cycle flow is described to better convey the sequence of modules. Lastly, the actors involved with the processes and how they were denoted in the document are listed.
- **Chapter 3 | Offices**: This chapter begins the elaboration of CU's office activities.
- **Chapter 4 | Administration**:
- **Chapter 5 | Admission/Enrollment**:
- **Chapter 6 | Recruitment**:
- **Chapter 7 | Accomodation**:
- **Chapter 8 | Academic**:
- **Chapter 9 | Exam Control & Result**:
- **Chapter 10 | Security**:
- **Chapter 11 | IT Infrastructure**:
- **Chapter 12 | Miscellaneous**:
- **Chapter 13 | Conclusion**:

2. Inception

In the inception phase of the project, Chittagong University representatives presented overviews of their existing processes along with a list of modules that provided the structure for the whole of the requirements analysis process. They also provided their administrative lifecycle that included the management of all employees and students including admission and registration of new students and their complete examination process, giving an idea of the sequence of modules. Based on the processes, the actors involved have been derived.

List of Modules

During the inception of this project, CU specified 10 broad modules that encapsulate the processes needed to be automated. These modules have been the reference with which the SRS document has been structured. The modules are:

1. Exam....

Actors of the Proposed System

The CU automated system contains a list of actors to conduct various academic and administrative activities. In this document, for some actors, multiple names are used depending on the context of the tasks being described. Below is the list of such actors with their synonyms.

Actor	**Names Used**	**Explanation**

3. Offices

Registrar’s Office

Existing System:

The Register (in charge) handles various administrative duties of the university. It also handles 5 councils such as Syndicate, Academic Council, Finance Committee, Planning and Development Committee, Senate. After the Vice Chancellor fixes a meeting date, the office arranges these meetings.

These councils manage different sectors of administration of the university. The Syndicate is the executive body of the university, the Academic council is concerned with the academic aspects of the university, the Finance Committee is responsible for budgetary and financial decisions, the planning and development committee is responsible for maintaining and developing the university premise and the Senate is the legislative body of the university.

For meetings of each council, the vice chancellor’s office calls the meeting and fixes the agenda. The responsibilities of the Register’s office is to send the agendas and meeting schedule to the interested parties, record meeting decisions and discussion and keep record of them. The office also compiles a list of MPhil and PhD nominations for the vice chancellor’s office to approve. The office is highly intertwined with the office of the Vice Chancellor in its duty.

Automation proposal:

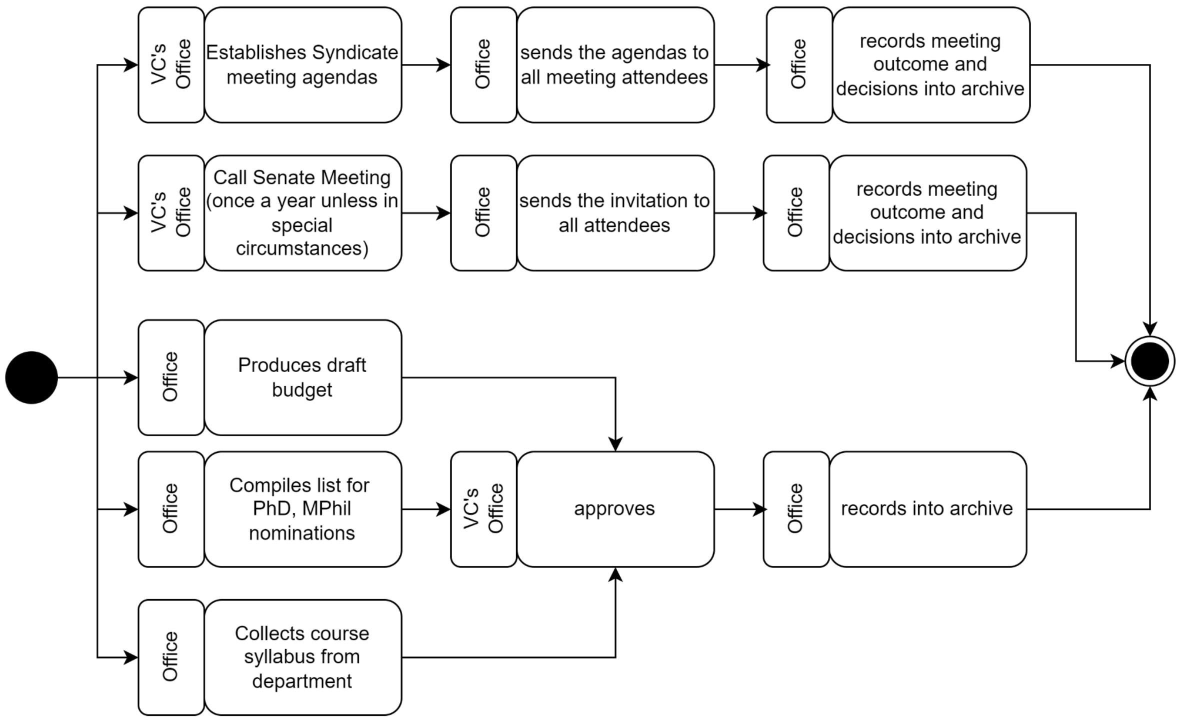
The Registrar's Office is a crucial administrative department responsible for overseeing various administrative tasks and coordinating with higher authorities.

The VC (Vice-Chancellor) office takes the lead in establishing the agendas for Syndicate meetings, which are significant decision-making bodies within the institution. Additionally, the VC office calls for the Senate Meeting, typically conducted once a year unless special circumstances require an additional meeting.

The Registrar's Office plays an essential role in facilitating these meetings. They are responsible for sending the meeting agendas to all the attendees, ensuring that all necessary documents and information are provided to facilitate informed decision-making. The office also maintains detailed records of the meeting outcomes and decisions, archiving them for future reference.

The Registrar's Office is also involved in financial matters. They produce the draft budget, which serves as a financial plan for the institution. Additionally, the office compiles a list of nominations for Ph.D. and M.Phil programs, ensuring the selection process is carried out efficiently.

Furthermore, they collect course syllabi from different departments, recording and archiving them after approval from the VC office.



Process flow for Registar(in charge) office :

Steps	Actor	Description
Meeting setup & record	VC office	• Establishes Syndicate meeting agendas • Call Senate Meeting (once a year unless in special circumstances)
	Office	• Sends the agendas to all meeting attendees • Records meeting outcome and decisions into archive
Miscellaneous	Office	• Produces draft budget • Compiles list for PhD, MPhil nominations • Collects course syllabus from department

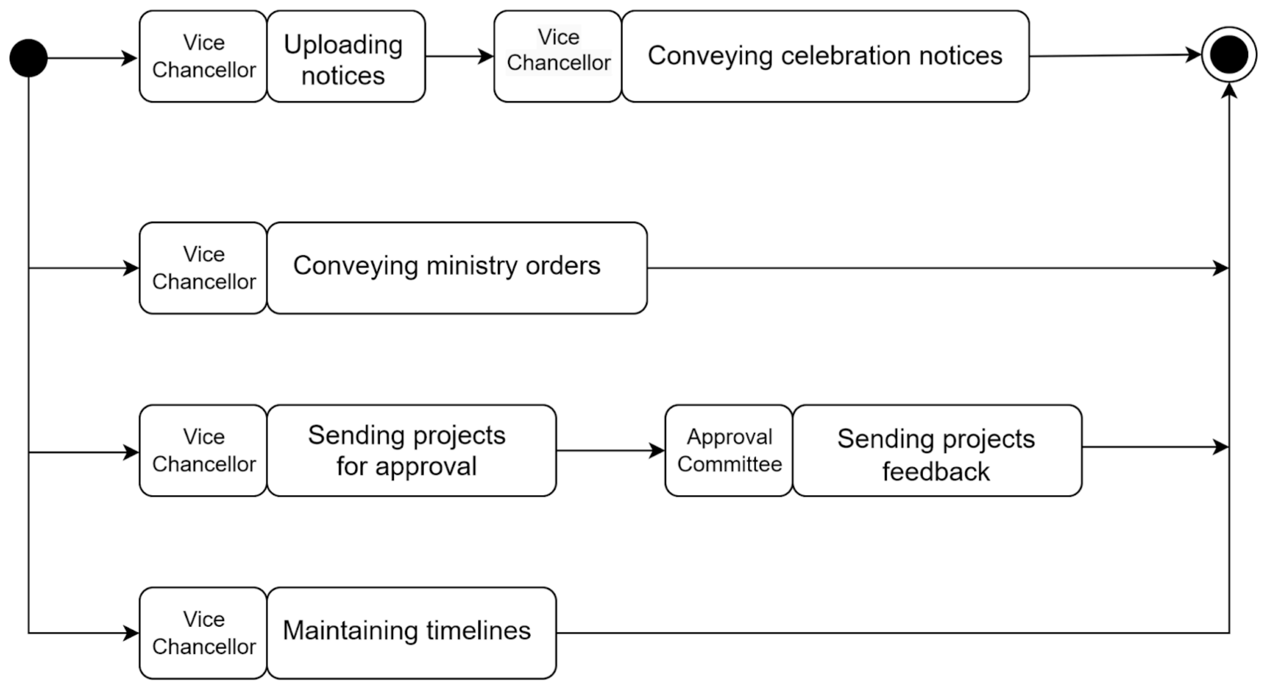
		• Records into archive after approval from VC office
	VC Office	Approves decisions from Registar (in charge) office

Vice Chancellor’s Office

An institution has several duties such as uploading notices to the website, conveying orders coming from the ministry to the teachers. The vice chancellor performs these duties. He conveys the letters, projects of ministry to the students and approval committee. He also maintains the timeline of temporary staff and teachers.
Another important institutional task is to convey to students about national day celebrations notices.

Steps	Actor	Description
Uploading notices	Vice Chancellor	The vice chancellor uploads the recent notices to the institute website.
Conveying celebration notices	Vice Chancellor	After uploading the notices on the website,he conveys the students about national day celebration notices particularly.
Conveying ministry orders	Vice Chancellor	Any order, letter etc. coming from the ministry is conveyed to the teachers.
Sending projects for approval	Vice Chancellor	Sends the projects coming from the ministry or other institutions to the approval committee.
Maintaining timelines	Vice Chancellor	The vice chancellor maintains the timeline for temporary staff and teachers and conveys that to the person whom it may concern.

Action diagram for the process flow:


Vice Chancellor
Uploading notices
Vice Chancellor
Conveying celebration notices
Vice Chancellor
Conveying ministry orders
Vice Chancellor
Sending projects for approval
Approval Committee
Sending projects feedback
Vice Chancellor
Maintaining timelines

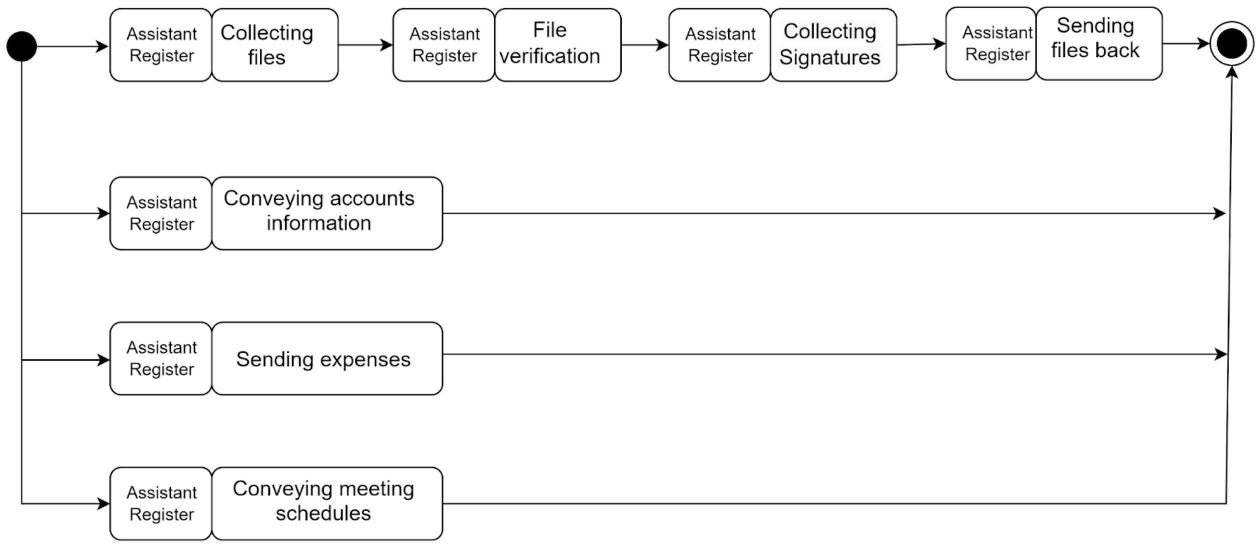
Pro-Vice Chancellor's Office

Official works are conducted by assistant register. He takes the files from register office and checks validity. After file verification, he follow-up the files to the teachers. The teachers give signatures on those files and the assistant register collects those and finally sends it back to the register office. He also manages the account office related works such as information flow between account office and teachers. Sends the checkbooks and monthly expenses of offices to the account section. Another important work of the assistant register is to convey meeting dates to the teachers.

Process flow for official works :

Steps	**Actor**	**Description**
Collecting files	Assistant register	The assistant register collects files from register office.
File verification	Assistant register	Checks whether the files are correct or not.
Collecting signatures	Assistant register	Sends the files to the teachers and tackles signs.
Sending files back	Assistant register	Sends the signed files to the register office again.
Conveying accounts information	Assistant register	Conveys account related information to the teachers.
Sending expenses	Assistant register	Sends monthly expenses to the account office
Conveying meeting schedules	Assistant register	Conveys upcoming meetings to the teachers.

Action diagram for the process flow:


Assistant Register
Collecting files
Assistant Register
File verification
Assistant Register
Collecting Signatures
Assistant Register
Sending files back
Assistant Register
Conveying accounts information
Assistant Register
Sending expenses
Assistant Register
Conveying meeting schedules

Board of Advanced Studies

The work of the board of advance studies is divided into the following parts:

1.Leave Management: Manages the details of teachers' educational leave for higher study in foreign nations.Handles information on increasing the leave and enrolling in university after the leave is completed.

2.Mphil,PHD Management: Mphil and phd management comprises registration for mphil and phd, as well as renewing the registration expiry date. This area also covers mphil and phd scholarship responsibilities.

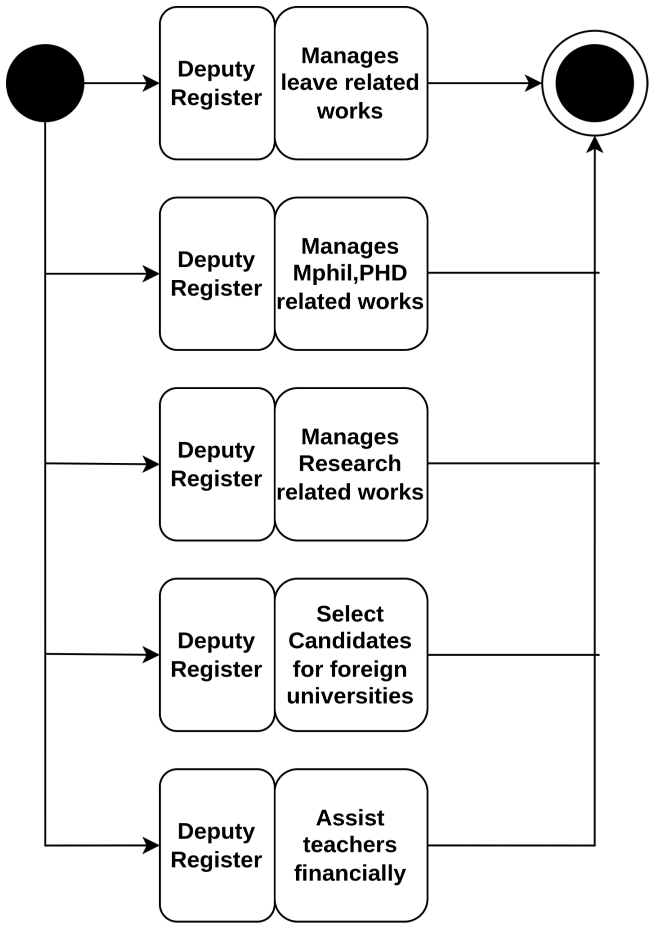
3.Research Management: This section handles UGC research-related activities as well as resources provided by the honorable Prime Minister or state government for any research.

4. Other: It also selects candidates for representation in foreign universities and financially assists teachers in attending various overseas conferences.

Steps	Actor	Description
Manage leave related works	Deputy Register	Manages the details of teachers' educational leave for higher study in foreign nations.Handles information on increasing the leave and enrolling in university after the leave is completed.
Manage Mphil,PHD related works	Deputy Register	Comprises registration for mphil and phd, as well as renewing the registration expiry date. This area also covers mphil and phd scholarship responsibilities.
Manage Research related works	Deputy Register	Handles UGC research-related activities as well as resources provided by the honorable Prime Minister or state government for any research.
Select candidates for foreign universities	Deputy Register	Selects candidates for representation in foreign universities
Assist teachers	Deputy Register	Assists teachers financially in attending

financially		various overseas conferences

Action diagram for the process flow:



4. Administration

Registrar Office

The registrar building is the heart of administrative activities spanning from sanctioning all kinds of forms to conducting meeting and decision making. Until now most of the tasks are carried out manually within its 19 major functional sections. Deputy registrars, assistant registrars, and other 3rd class officers are responsible for the functionalities of each section. The responsibilities of these sections are briefly described below:

1. **Registrar SHONGJUKTO Section:**
2. **Counsel Section:** Meetings called by the VC are conducted and a combined decision constituting 5 bodies is made. These 5 bodies include the senate, syndicate (administration), academic council, planning and development committee, and finance committee (for budget).
3. **Estate Section:** Tracks information and accounting of the allotted land to the university. Moreover, CU rents portions of its current 2200 acres of land to different shops, farmers, etc. Surveillance and collecting payments from them is also the responsibility of this section. Furthermore, added responsibilities include- lawful trial management against stakeholders and neighbors, managing gardeners, guest houses, and research stations in Dhaka, Campus, and Cox Bazar.
4. **Election and Constitution Section:** Solely handles election of syndicate, senate, academic council (admin), etc. representatives. Defining various rules for governance as well as maintaining them over time.
5. **General Leave Section:** Leave grants subject to medical, temporary, management, maternity, faculty or employee tour, duty, etc. are handled by this section. The entire process of leave timeline management is done here.
6. **Confidential Section:** This section is responsible to manage different sorts of occurrences throughout the campus. Also handling issues of teachers going abroad and not returning, forming investigation committees, etc.
7. **Part-time Appointment Section:** Managing external teachers for honors courses, appointing guest teachers from different departments based on demand, appointing teachers from school and college, etc. These decisions are made by the academic committee.
8. **General Section:** The general section handles a diverse set of responsibilities. The categories are defined below:
    a. **Exporting Expertise:** Management, sending, and tracking specialized committees for the government, private and public sectors, etc.
    b. **Hall Notice:** Hall related committees are formed and notices targeted to students are formulated. Library and advisor committees are also made in this section.
    c. **Contract Signing:** Contract signing to establish mobile network towers, money collection, MOU with local/international universities, etc.
    d. **Transport:** Managing contracts for shuttle trains within the campus and determining fares.

9. **Photography Section:** Photographic event management for newspapers, university functions, etc.
10. **Teacher Appointment Section:** Based on individual department's demand and VC's proposal , syndicate members deal with the appointment of new faculty. This section also handles promotion of teachers based on guidelines of the selection board. This selection board is also constructed by the syndicate, VC, or other nominees.
11. **Central Store Section:** Inventory management is the main responsibility where it handles stationary items, lab equipment, xerox, computer parts, typewriter, etc. Apart from just storing it is also involved with purchase and tender management based on regulations. Additionally, the store section prints forms and other papers required for administrative processes.
12. **Academic Section:** All academic regulatory activities of honors, masters, mPhil, PhD, student enrollment, registration is managed in this section. Student enrollment committee is determined in this section. Moreover, managing transcript and marksheets (not issued here) along with their duplication or lost reporting is done here. This section only issues academic transcripts.
13. **Officer Appointment/Promotion Section:** Manages the appointment of hall provost, house tutors, proctor, etc.
14. **3rd Class Employee Appointment Section:** This section is responsible for maintaining the appointment, promotion, retirement, timescale, etc of 3rd class employees.
15. **SHIKKHOK BEKTIGOTO NOTHI Section:** Track faculty records regarding promotion, salary increment, high-scale record, etc.
16. **Higher Education and Research Section:** This section's primary role is the management of advanced study degrees as PhD and MPhil. It includes managing registration, course determination, qualification of going abroad, study leave of 3 years with extension up-to 1 year without salary, etc.
17. **4th Class Employee Appointment Section:** Similar functionality to section (14) but concerns with 4th class employee management.
18. **Computer Section:** This section now deals with typing and printing all formal letters.
19. **Central PRERON Section:** Disperses all mail to local, abroad, or post office. All sections send their respective letters to this section to disbursement.

Planning and Development Department

As the name suggests, this department is associated with Chittagong University's development works and planning activities. The plans are actually implemented by the Engineering Department in close regulation with the planning department. The core activities of this department can be divided into 5 broad categories. These are discussed below in brief:

1. **Project Proposal and Development:** This department creates the Development Project Proposal (DPP) consisting the requirements, time, and budget for the proposed project. This DPP is sent to the ministry for approval and funding. Approval of any internal project and implementing them with close association with the Engineering Department is one of the most crucial responsibilities. These activities are monitored by a selected development committee.
2. **Academic:** Planning the introduction of new institutes and departments in the university is done here. This task is done with close coordination with UGC's regulations.
3. **Financial:** The engineering department sends bills to this department for auditing and approval. The planning department sends these bills to the accounting section. Moreover, the planning department allocates financial grants based on faculty and this decision goes through the approval chain of the financial committee and syndicate.
4. **Faculty Leave Planning:** Select teachers to PhD and training planning in a deen-based manner. The actual processing and leave management is done by the registrar office.
5. **Inventory Management:** Although the registrar office has a separate inventory management system, it is used for recurring items to manage the university. Whereas the planning department handles project-based inventory.

Engineering Office

The University Engineering Office is responsible for maintenance and development tasks within the university. This section consists of two main areas of work: Maintenance and Development. The Maintenance work involves overseeing the regular maintenance and repair of university buildings, electrical systems, water supply, and gas supply. On the other hand, the Development work focuses on the planning, execution, and coordination of construction projects, including building construction, electrical works, water supply, and telephone installations.

Steps	Actor	Description
Requirements collection (Maintenance Works)	All Department, Institute, Hall, and Administrative Office	All departments, institutes, halls, and administrative offices send a letter to the Engineering Office with a list of required works. Works are then prioritized based on urgency (Normal & Urgent) and appropriate measures are taken accordingly.
Maintenance	Chief Engineer	Act as the administrative head of the Engineering Office and perform overall management and coordination of all engineering matters.
Development	Superintending Engineer	Act as the Officer-in-Charge of a Circle and supervise and coordinate all construction, maintenance, and repair works within the assigned circle.
Development	University Engineer/ Executive Engineer (Civil)	Act as the Officer-in-Charge of a Zone and oversee all works within the assigned zone, including checking estimates, inviting tenders, supervising construction and repair works, executing projects, and verifying contractor bills.

Development	Executive Engineer (Electrical)	Act as the Officer-in-Charge of a Zone and be responsible for all electrical works, water supply, and telephone installations within the assigned zone. This includes checking estimates, inviting tenders, supervising development and maintenance works, executing projects, and verifying contractor bills.
Maintenance/ Development	Assistant Engineer	Assist the respective Superintending Engineer/Executive Engineer in their duties, supervise construction and repair works, check estimates prepared by Sub-Assistant Engineers, verify contractor bills, and perform additional duties assigned by university authorities.
Maintenance/ Development	Sub-Assistant Engineer	Assist the respective Superintending Engineer/Executive Engineer/Assistant Engineer in their duties, prepare estimates, supervise construction and repair works, ensure satisfactory completion of projects, take measurements, prepare bills, and fulfill other assigned responsibilities.
Payment and Billings	Accounts and Registrar	Manage budgets, process billings, and make payments for services and management.

Work Approval	Chief Engineer, VC and Planning and Development Committee/relevant approving authority	The Engineering Office prepares the budget for maintenance works and submits it for approval to the relevant approving authority within the university. The approval process is as follows: Chief Engineer: The Chief Engineer has the authority to approve maintenance budgets up to 10,000 Taka. Vice-Chancellor (VC): The VC has the authority to approve maintenance budgets up to 200,000Taka. Planning and Development Committee (PDC)/ Relevant Approving authority: Maintenance budgets exceeding 200,000 Taka are escalated to the Planning and Development Committee for review and approval.
Store Management	Store Keeper	Maintain records of all store items, such as instruments and spare parts, and add new items as needed.

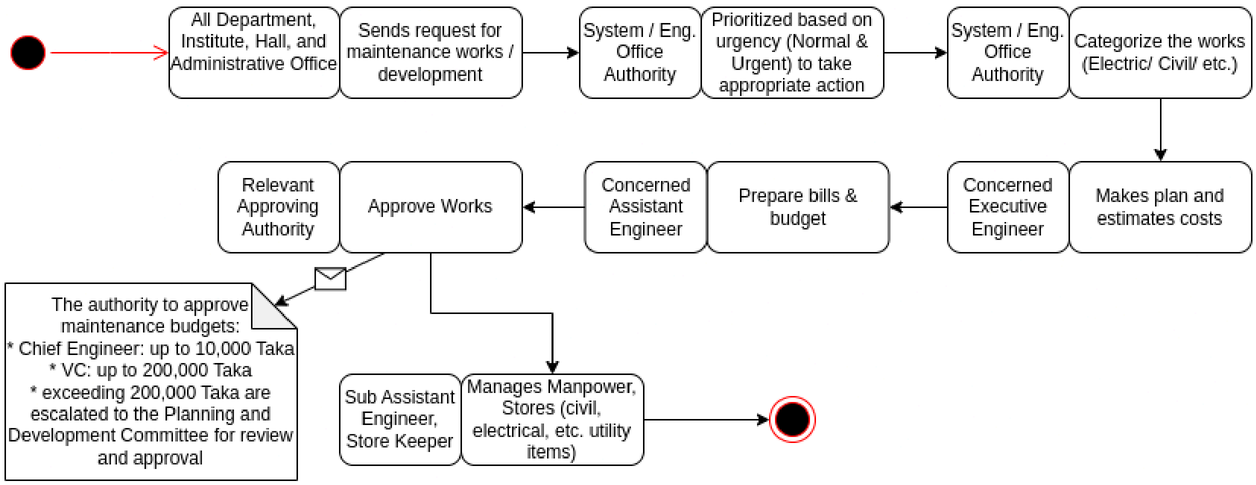


Figure: Engineering Office Task Management

Accounts

As any other operational institute, the account section of Chittagong University deals with the billing management of all functional bodies of the university. Billings coming from other offices are received in the accounts section and audited. Later, checks are disbursed to respective offices.This section is also responsible for internal audit, loan management, yearly budgeting, and cash flow accounting. The entire functionality of the accounts office is divided into 14 major sections. The responsibilities of each section is briefly described below:

1. **Establishment:** This section is responsible for managing - i) employee billing of the accounts department itself, ii) billing files, and iii) stock.
2. **TADA:** Travelling Allowance (TA) and Dearness Allowance (DA) is tracked and billed in this section. It handles visitor allowances coming for different occasions in the university.
3. **Exam Bill:** Bills from all types of expenses occurring to conduct exams in the university are handled in this section. For example, question printing, exam guarding, checking, and other processing.
4. **Miscellaneous Bill:** Costs that do not require a separate section are handled here. For example: fuel, vehicle maintenance, stationary, employee overtime, etc.
5. **Development:** Billing of all development works. The bills are deposited by the Planning and Development department of the university. The bills are audited and checks are issued to the engineers involved.
6. **Cash:** Receives all checks coming from different offices and disburses cash after proper verification of the checks. The inflow outflow of cash is well tracked.
7. **Salary:** This section tracks salaries of first class teachers/officers and also second class employees. Tracking promotion and income increment processing is also done here.
8. **Internal Audit:** Processes bills coming from the Planning and Development Office and exams. These audits validate the amount and reason of billing.
9. **Pension:** Generating pension bills and disbursement for all valid employees is done in this section.
10. **Provident Fund:** The accounts section manages a provident fund where 10% of employee salary is deposited and employees can take loans against individual funds. A 13% interest rate is rewarded during final withdrawal from employees. This section handles accounting of these individual fund management.
11. **Recurring/ Yearly Accounts:** Calculation of trial-balance, managing ledger, and tracking cash flow (income, expense). This year round recurring process is done here.
12. **Computer:** Currently the computer section just keeps a digital record in an existing software, specially for payroll and pension management.
13. **Budget:** Formulates the yearly budget to conduct the university processes. This section also reports to the UGC every 3 months with accounting reports and bank statements.
14. **Internal Loan:** Similar to provident fund, the account section provides an additional loan facility to only employees of the accounting department. The fund management is done internally, and the university authority does not need to be concerned about this.

Transport Management

The University Transport Section is responsible for providing transportation services and managing the transport operations within the university. This section comprises two main areas of work: Transport Service and Management. The Transport Service includes regular bus services for teachers and university staff, as well as special transportation needs for events such as admission exams and university closures. Additionally, cars are allocated to specific university personnel for official purposes. The Management aspect involves tasks such as schedule publishing, vehicle monitoring, maintenance, bus renting, manpower management, store management, and payment and billings.

Steps	Actor	Description
Transport Service (BUS)	Teachers, University Staff	Provide regular bus services for teachers and university staff, and arrange transportation for special occasions.
Transport Service (Car)	Deans, VC, Pro-VC, Proctorial Body, Provost, Registrar Office staff, Security Forces, ICT Cell members, and other administrative bodies	Allocate cars to specific university personnel, including Deans, Vice-Chancellors, Pro-Vice-Chancellors, Proctorial Body members, Provosts, Registrar Office staff, Security Forces, ICT Cell members, and other administrative bodies, for official purposes such as attending programs, meetings, and seminars upon request.
Management	Security Personnel	Monitor the movement and ensure the security of all buses and cars.
Schedule Publishing	Transport Department	Publish the bus schedule daily for easy access and reference.

Vehicle Monitoring	Security Personnel	Monitor and track the location and usage of buses and cars in real-time.
Vehicle Maintenance	Maintenance Staff	Regularly check the fitness of buses and cars, perform repairs, and manage fuel and diesel loading.
Bus Renting	Transport Department	Coordinate with BRTC (Bangladesh Road Transport Corporation) for bus rentals when needed.
Manpower Management	HR Department	Recruit and manage bus drivers and support staff for the transport section.
Store Management	Store Keeper	Maintain records of all store items, such as instruments and spare parts, and add new items as needed.
Payment and Billings	Accounts and Registrar	Manage budgets, process billings, and make payments for transport services and management.

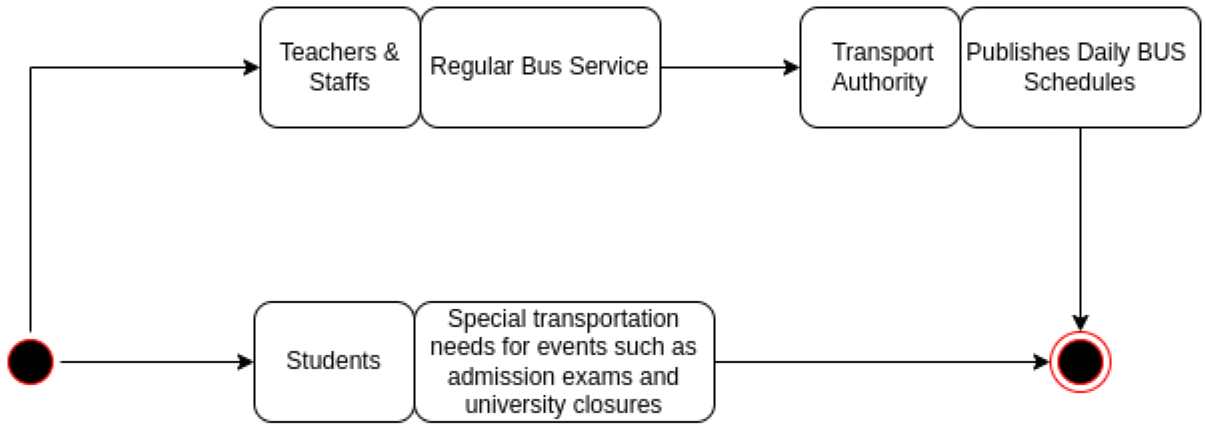


Figure: BUS Service

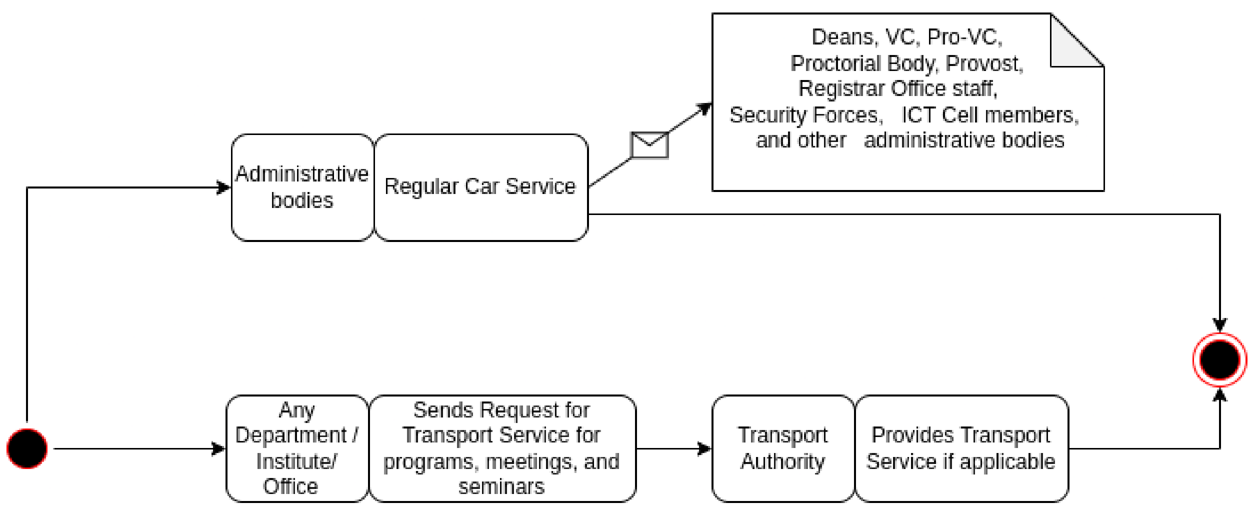


Figure: Car Service

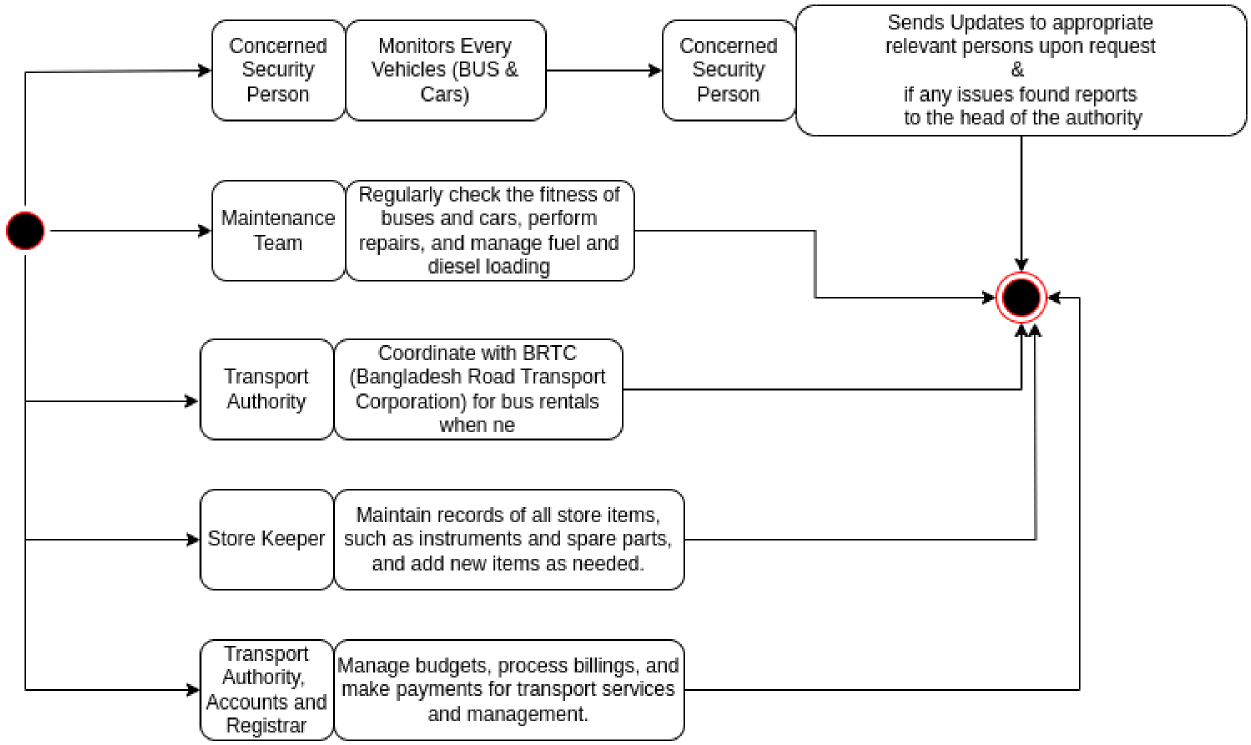


Figure: Vehicle Monitoring, Maintenance, Renting, Store Management, Payment & Billings

Medical Office

Existing System:

1. Students collect tickets from medical office for appointment
2. Pharmaceutical supply records are being maintained in paper ledger
3. Documents passing happen to be completed in traditional way

This module provides a brief description of the activities and automation prospects of the Medical Department Office. This aims to automate various activities to enhance efficiency and improve the overall functioning of the office. We'll discuss possible automation activities for the following sub-modules under this section.

1. Appointment Management System
2. Digital Prescription Generation
3. Emergency Alert System
4. Ledger Maintenance of Pharmaceutical Supplies
5. Electronic Document Handling

There'll be a separate interface for the medical office administrator to manipulate the system. Some of the features will also be available to other actors of the module such as, students, doctor, emergency medical team etc.

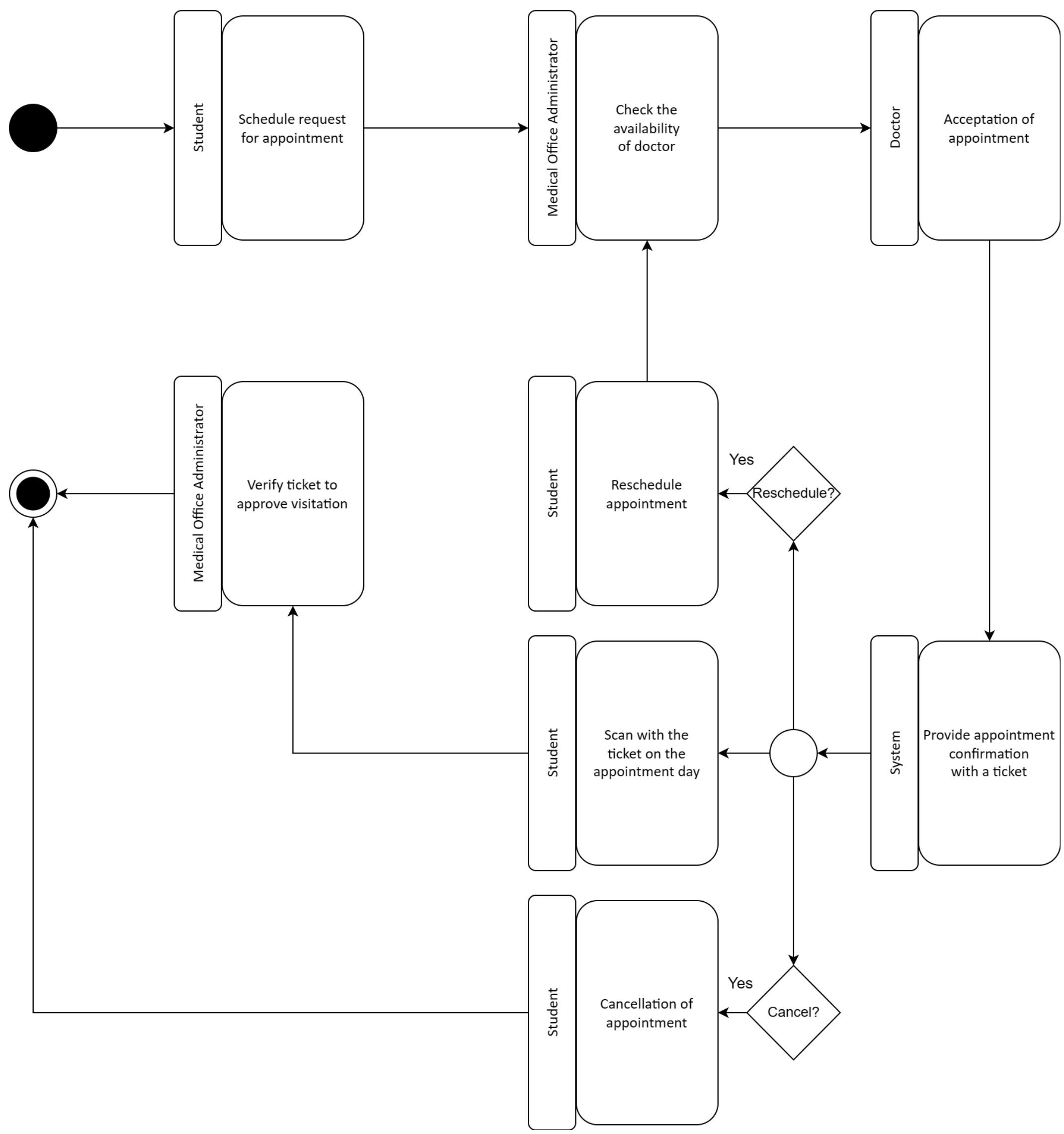
Appointment Management Section

In the Appointment Management System sub-module, the main objective is to provide students with a user-friendly interface that simplifies the process of scheduling appointments with doctors at the medical office. By automating this process, the system aims to improve overall patient experience.

Students will have access to the system where they can easily view the available time slots for different doctors. They will be able to browse through the calendar, select their preferred dates and times, and book appointments accordingly. The system will provide real-time availability updates, ensuring that students can make informed decisions when choosing their appointment slots.

To confirm the successful booking, the system will promptly send a confirmation email with a ticket to the students. This ticket will include all essential details such as the appointment date, time, doctor's name, and location. The student will have to bring this ticket on the appointment day and scan it to avail the visitation opportunity. This feature aims to enhance communication and reduce any confusion regarding the appointment details.

The medical office administrator will have a separate interface that allows them to verify, manage and manipulate the appointment schedule. This interface will provide administrative functionalities such as rescheduling or canceling appointments upon students' request, updating doctor availability, and managing any urgent or emergency appointments. The administrator can easily view the appointment calendar, make necessary adjustments, and ensure a smooth flow of appointments within the medical office.



Steps	Actor	Description
Schedule Appointment	Student	Schedule request for appointment
	Medical Office Admin	Check the availability of the doctor
	Doctor	Acceptance of appointment
	System	Provide appointment confirmation with a ticket
Ticket Verification	Student	Scan with the ticket on the appointment day
	Medical Office Admin	Verify ticket to approve visitation
Reschedule Appointment	Student	Request for rescheduling appointment
	Medical Office Admin	Check the availability of the doctor
	Doctor	Acceptance of appointment
	System	Provide appointment confirmation with a ticket
Cancel Appointment	Student	Request for cancellation of appointment

Digital Prescription Generation

In the Digital Prescription Generation sub-module, the primary goal is to transition from traditional handwritten prescriptions to a more efficient and accurate digital format. By automating this process, the system aims to provide prescription management, reduce errors, and enhance the overall patient experience.

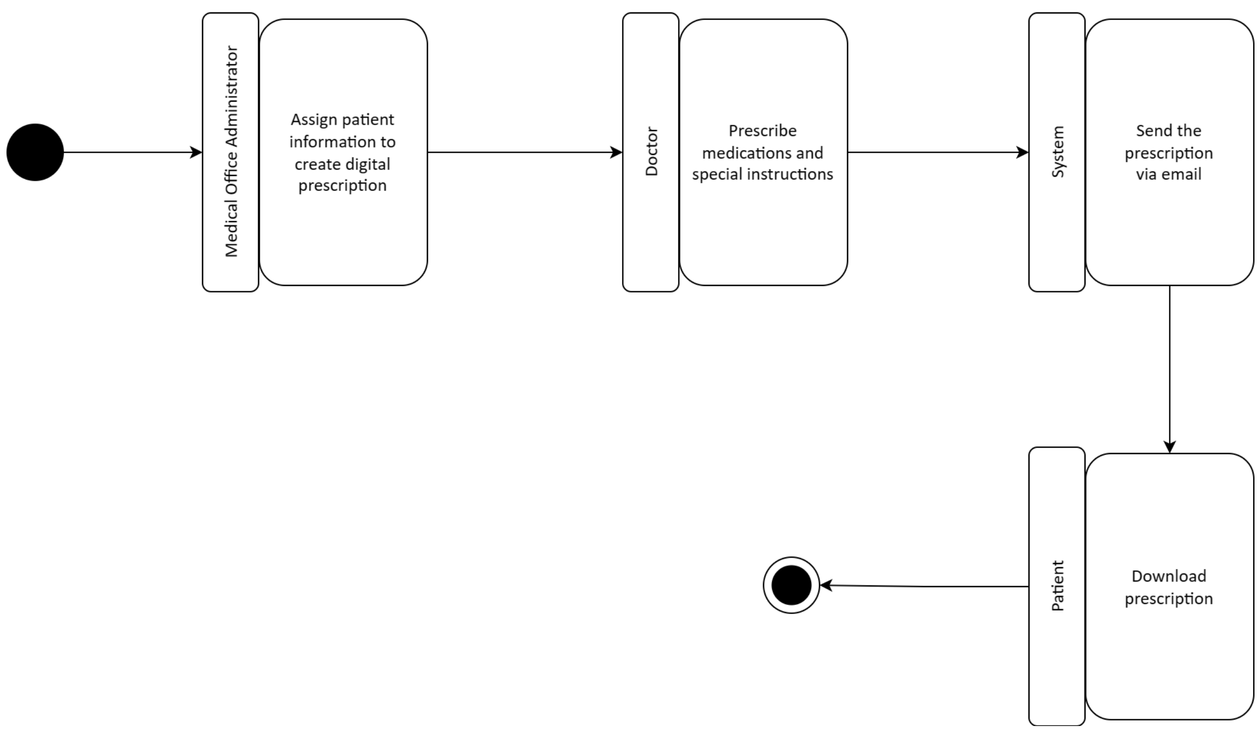
Upon the verification of the ticket, the medical office administrator will initially generate a prescription with patient information including name, age, medical history, and any other relevant details.

Doctors will have access to a user-friendly interface specifically designed for digital prescription generation. Within this interface, doctors can then proceed to prescribe medications by selecting from a predefined list or manually entering the medication names, dosages, and frequencies.

To ensure that the digital prescriptions hold legal validity, the system will support electronic signature capabilities. Doctors will be able to electronically sign the prescriptions, attesting to their accuracy and authenticity. This feature not only ensures compliance with regulatory requirements but also adds an additional layer of security and trust to the prescription process.

Once the prescription is complete, the system will offer multiple options for the doctor to share it with the patient. Doctors can choose to print the prescription and provide a physical copy to the patient during the visit. Alternatively, the system will enable doctors to share the digital prescription with patients electronically via email. This allows patients to have easy access to their prescriptions without the need for physical paperwork.

The automation of the prescription generation process not only enhances the efficiency and accuracy of the medical office but also provides a more convenient and accessible experience for both doctors and patients. By eliminating the need for handwritten prescriptions, this sub-module reduces administrative burdens, improves patient safety, and fosters a more seamless healthcare journey.



Steps	Actor	Description
Initiate Visitation	Medical Office Admin	Assign patient information to create digital prescription

Digital Prescription Creation	Doctor	Prescribe medications and special instructions
Storing of Prescription	System	Send the prescription via email
	Patient	Download the prescription for a physical copy

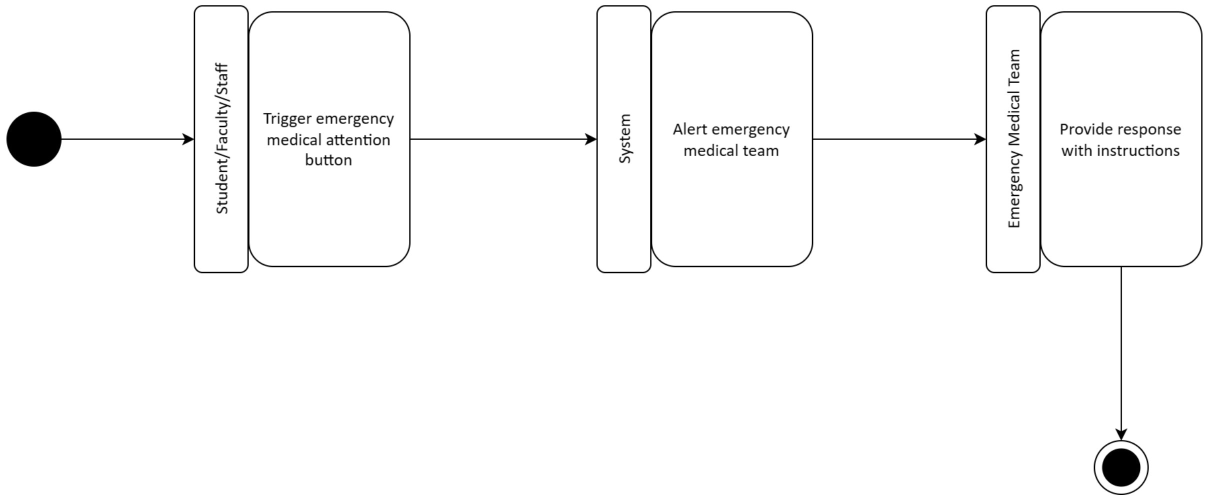
Emergency Alert System

The Emergency Alert System sub-module is designed to ensure timely response and coordination in case of emergencies that require immediate attention within the medical office. By automating this system, the goal is to enhance emergency preparedness, facilitate rapid communication, and improve the overall safety of individuals within the medical office environment.

Students, staff members or any faculties will have the capability to activate emergency alerts through the system. This can be done through a dedicated interface of a mobile application specifically designed for emergency management. The activation process will trigger the system to initiate the alert dissemination process.

Once an emergency alert is activated, the system will promptly send notifications to the designated emergency medical teams. These notifications will include crucial details regarding the emergency and its precise location within the medical office premises. By providing accurate location, the system enables medical teams to respond quickly and efficiently to the emergency situation.

The Emergency Alert System will also support tracking and acknowledgment of emergency alerts by medical staff. This means that once an alert is received, medical team members can acknowledge their awareness and readiness to respond. This feature allows the activator of the emergency event to monitor the status of the response.



<table>
<tr><th>Steps</th><th>Actor</th><th>Description</th></tr>
<tr><td rowspan="3">Emergency Situation</td><td>Student</td><td rowspan="3">Trigger emergency medical attention button to acknowledge the emergency situation</td></tr>
<tr><td>Faculty</td></tr>
<tr><td>Staff</td></tr>
<tr><td>Alert</td><td>System</td><td>Alert emergency medical team via a prompt notification</td></tr>
<tr><td>Medical Team Awareness</td><td>Emergency Medical Team</td><td>Provide appropriate response with the estimation of possible arrival time and other instructions</td></tr>
</table>

Ledger Maintenance of Pharmaceutical Supplies

In the Ledger Maintenance of Pharmaceutical Supplies sub-module, the primary objective is to automate the management and tracking of pharmaceutical inventory within the medical office. By implementing a software solution, this sub-module aims to improve accuracy, efficiency, and decision-making related to pharmaceutical supplies.

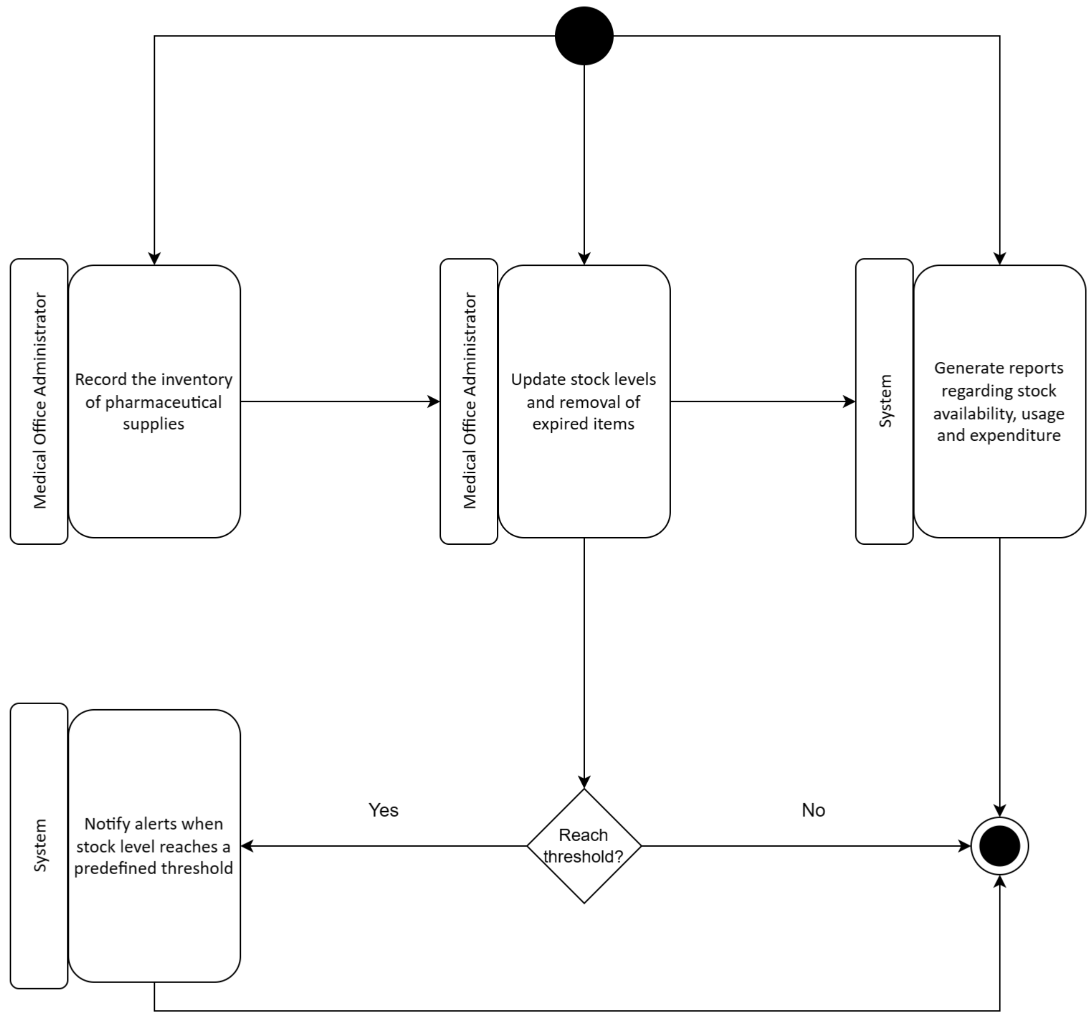
The software solution will provide a user-friendly interface specifically designed for recording and monitoring stock levels of pharmaceutical supplies. Medical office staff responsible for inventory management will have access to this interface, enabling them to easily update and track the availability of various supplies.

Within the interface, users can record new supplies as they are received, including details such as item name, quantity, batch numbers, and expiration dates. The system will also allow users to remove supplies that have expired or become depleted due to usage.

One of the key features of this sub-module is the generation of alerts or notifications. The system will be configured to monitor stock levels and compare them against predefined thresholds. When the stock levels of specific supplies reach or fall below these thresholds, the system will automatically generate alerts or notifications, notifying the responsible staff members about the need for restocking. This proactive approach ensures that the medical office can maintain an adequate supply of pharmaceuticals and avoid stockouts or delays in patient care.

Furthermore, the software solution will provide reporting capabilities, allowing users to generate reports on stock availability, usage, and expenditure. These reports can provide valuable insights into consumption patterns, identify high-demand items, and facilitate informed decision-making regarding inventory management and procurement.

By automating the ledger maintenance of pharmaceutical supplies, this sub-module significantly improves the efficiency and accuracy of inventory management processes within the medical office. The user-friendly interface simplifies data entry and tracking, while the alert system and reporting capabilities enable proactive monitoring and strategic decision-making. Ultimately, this automation enhances patient care by ensuring the availability of necessary pharmaceutical supplies while minimizing the risk of stockouts or wastage.



Steps	Actor	Description
Record Supplies	Medical Office Admin	Record the inventory of pharmaceutical supplies
Maintain Stocks	Medical Office Admin	Update stock levels and removal of expired items
	System	Notify alerts when stock level reaches a predefined threshold
Generate Reports	System	Generate reports regarding stock availability, usage and expenditure

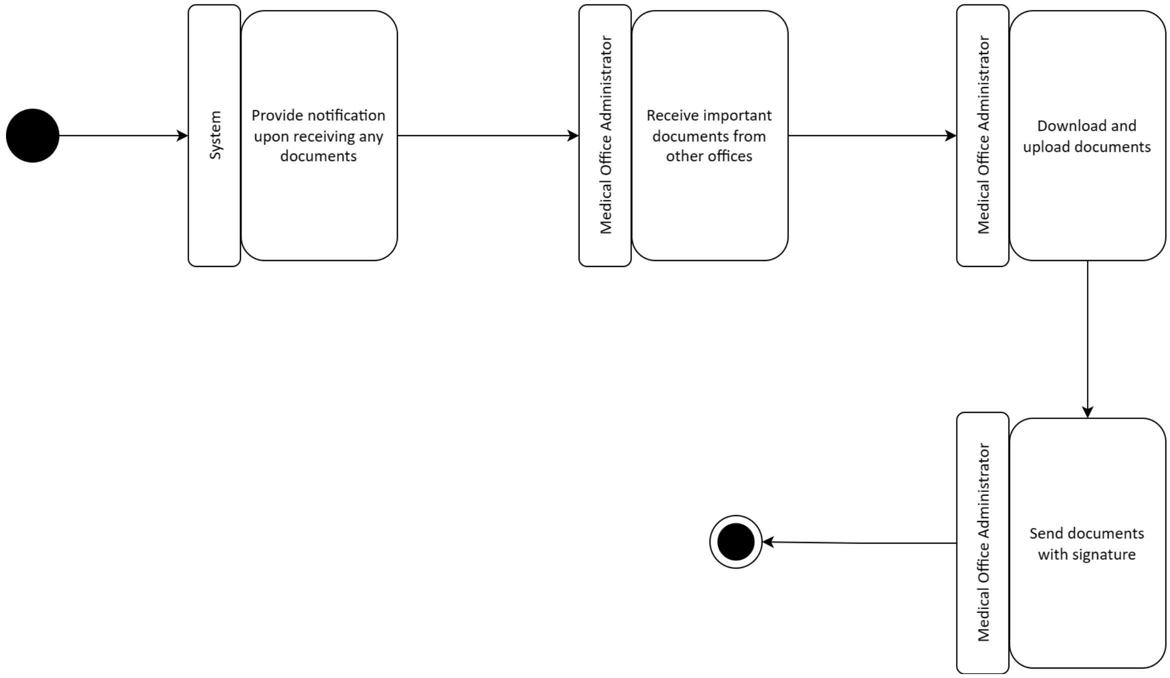
Electronic Document Handling

The Electronic Document Handling sub-module focuses on the transition from traditional paper-based document handling to a more efficient and organized electronic medium within the medical office and other departments. By implementing a document management system, this sub-module aims to provide document approval methods in an easier way.

The document management system will provide a centralized and secure repository for storing electronic documents. It will support various document formats, allowing users to upload files such as records, reports, invoices, and other relevant documents. The system will ensure data integrity and security by implementing appropriate access controls and encryption measures.

Once documents are uploaded, the system will provide features such as document scanning, indexing, and categorization. This allows for easy organization and retrieval of documents based on relevant criteria, such as patient name, document type, or date. Secure sharing among authorized users is facilitated by the system. Users can collaborate on documents by granting specific access rights to individuals or groups. This allows for seamless and controlled sharing of documents, enhancing teamwork and communication among office staff.

To keep users informed and up to date, the system will generate notifications or alerts when new documents are shared or require attention. Users will receive notifications via email, mobile app notifications, or within the system interface itself. This feature ensures that users are aware of any document-related activities or pending tasks that require their attention.



Steps	Actor	Description
Receive Documents	System	Provide notification upon receiving any documents
	Medical Office Admin	Receive important documents from other offices
Send Document	Medical office Admin	Download and upload documents with signature to finally send to respective offices

Library and Journal Management

Existing System:

1. 1. Students and teachers currently submit applications by physically obtaining issue forms from the library.
2. The tracking of books taken by students is not currently possible.
3. Traditional paper-based processes are used within the library office for the exchange of internal documents.
4. Access to digital resources such as PDFs, journals, and books is not facilitated through an online platform at present.

The Smart Library Management System aims to transform the existing traditional library operations into a modern and efficient digital solution. This system will provide students and teachers with an online portal for accessing library resources, a smart library card for streamlined book borrowing, and electronic document handling for internal processes.

1. Smart Library Card
2. Online Portal
3. Book Tracker
4. Electronic Document Handling

There'll be a separate interface for the librarian to manipulate the system. Some of the features will also be available to other actors of the module such as students, teachers, etc.

Smart Library Card

In the Smart Library Card sub-module, the primary goal is to offer students a user-friendly interface that eases the procedure of obtaining a library card from the library.

1. Online Application: Students and teachers submit their card issuance requests through the online portal. They input necessary details like name, ID, contact information, and other relevant data.

2. Registration and Data Association: Upon successful registration, the system processes the provided information and generates a unique smart library card for each user. The system associates the card with the user's provided details, creating a personalized profile.

3. Card Generation: The system generates a smart library card with a distinct identification code for each user. This code is a crucial identifier that links the card to the user's profile and grants access privileges.

4. Notification for Card Availability: Users receive a notification from the system when their smart library card is ready for collection. The notification may be sent via email or through the online portal's messaging system.

5. Card Collection: Users visit the library in person to collect their smart library cards. Users use their distributed smart library cards to gain physical access to the library premises. The card acts as an authentication method, allowing users to enter and utilize library facilities.

6. Access to Online Portal: The unique identification code embedded in the smart library card serves as an access key for the online portal. Users can log in to the portal using their smart card's code, granting them access to digital resources and services.

By implementing this process, the Smart Library Card sub-module aims to provide users with a seamless experience from card application to accessing library facilities and online resources.

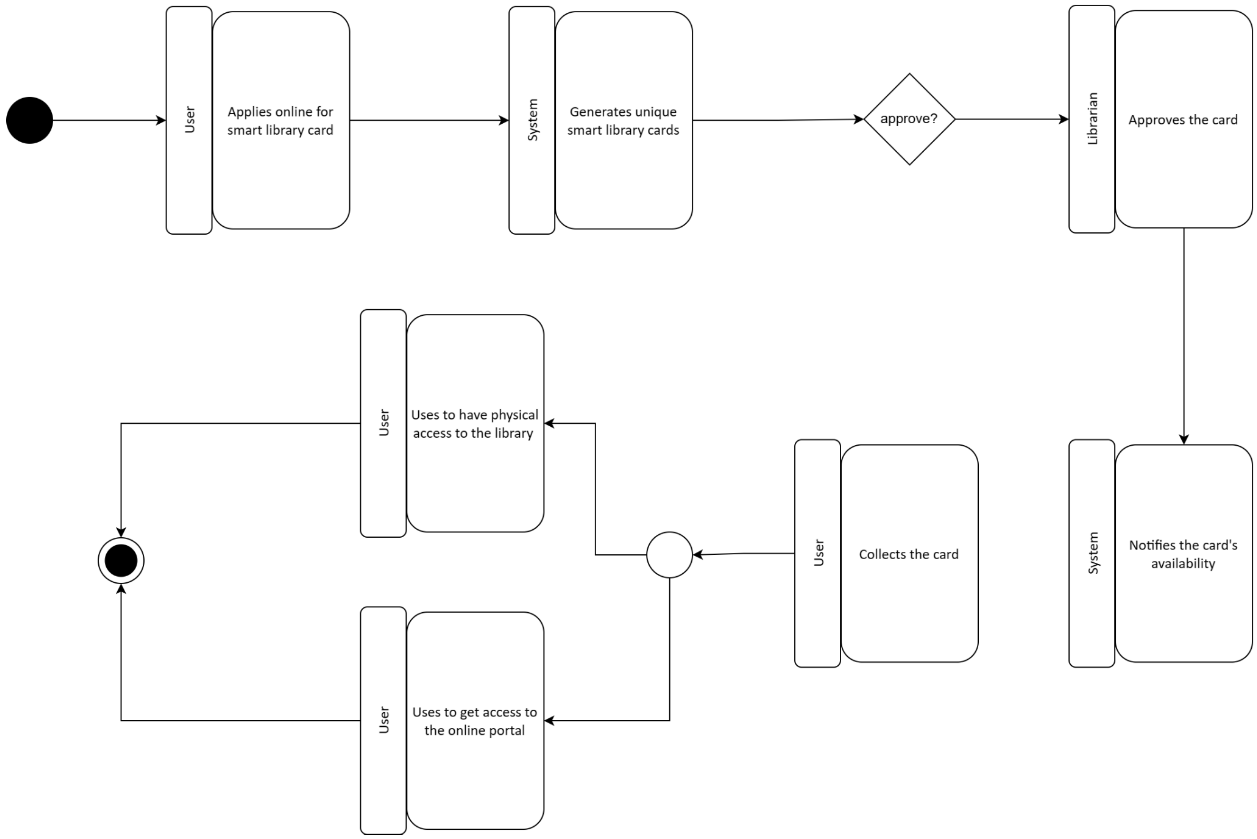


FIGURE-1: Process Flow of Smart Library Card

Actors:

1. Librarian
2. User (Student, Teacher)
3. System

Steps	Actor	Description
Register	User	Submit card issuance requests through the online portal.
	System	Process the request and capture user details
Generate	System	Generate a unique smart library card

Cards	Librarian	Verify card to approve issuance
Notify and Confirm Collection	System	Notify that the card is ready for collection
	Librarian	Confirm the collection status of the card
Visit Library	User	Use their smart cards to access library facilities.
Access to Online Portal	User	Grant access to the online portal using unique identification code of the smart card

Online Portal

In the Online Portal module, the primary aim is to establish a digital platform that empowers students, teachers, and librarians with efficient access to a wide range of library resources and services.

1. **Resource Management by Librarian:** Librarians log in to the online portal using their credentials. They navigate to the resource management section, where they can upload digital resources such as book PDFs and online journals. Resources can be categorized and organized by genre, subject, or any other relevant criteria.

2. **User Access and Browsing:** Authorized users (students and teachers) log in to the portal using their smart library card credentials. Users are greeted with an interface displaying different resource categories and featured content. They can explore categories and lists curated by librarians.

3. **Resource Search Functionality:** A robust search bar allows users to input keywords, titles, or author names. Users can perform searches to quickly locate the resources they need.

4. **Reading and Downloading:** Users can click on available resources to read digital books, access online journals, and more. They can also download resources for offline access, ensuring availability even without an internet connection.

5. **Notification for New Resources:** The portal displays notifications about newly added resources. Users receive alerts about fresh content, encouraging them to explore and engage with the latest materials.

By implementing this process, the Online Portal module aims to create a dynamic hub for resource discovery and utilization, providing a seamless bridge between traditional library services and modern digital conveniences.

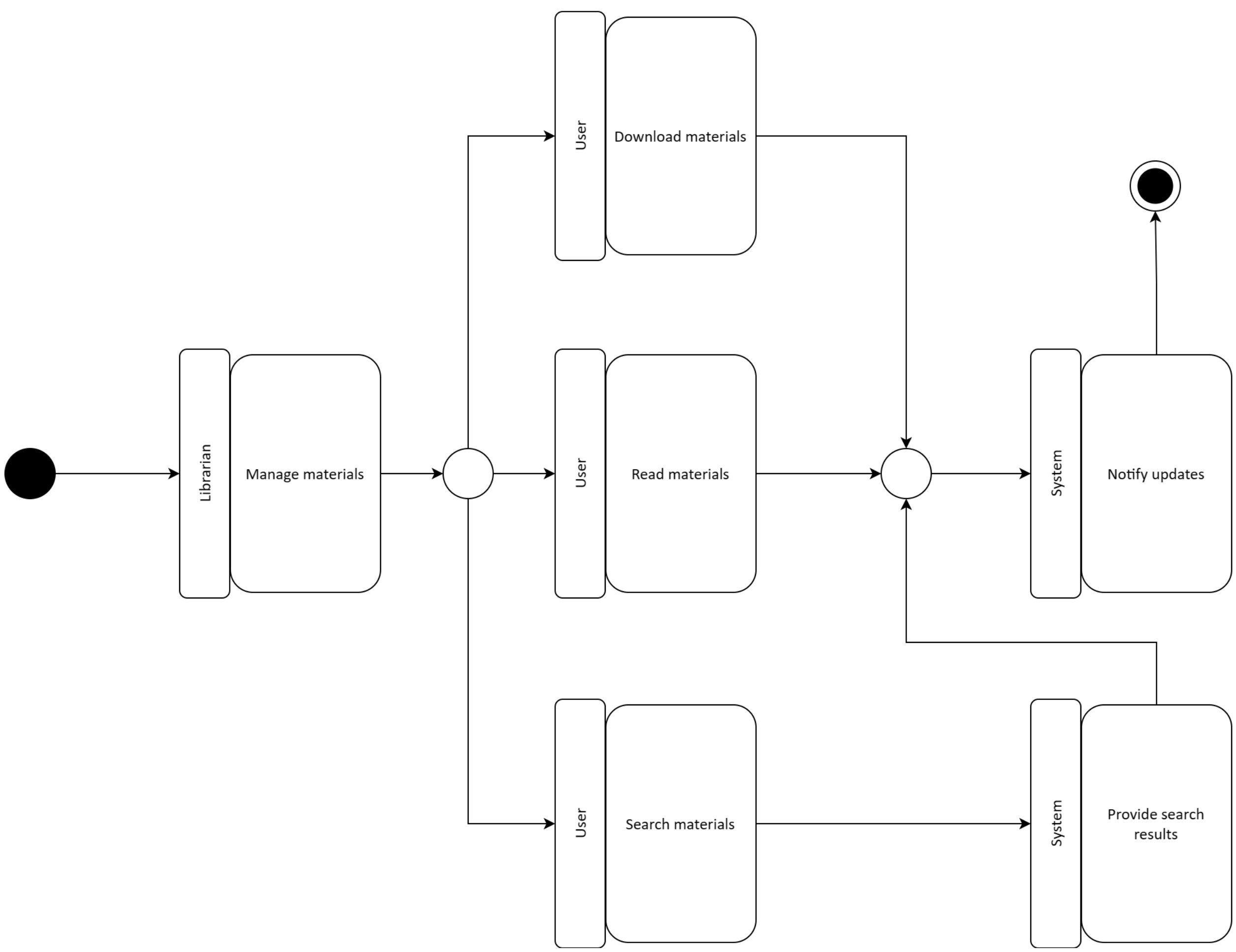


FIGURE-2: Process Flow of Online Portal

Actors:

1. Librarian
2. User (Student, Teacher)
3. System

Steps	Actor	Description
Upload Materials	Librarian	Log into portal and upload digital resources
Read Materials	User	Log into portal and surf through different categories to read
Search Materials	User	Input keywords to find specific materials
	System	Provide lists based on keyword
Download Materials	User	Download resources for offline access
Notify Updates	System	Receive alerts for fresh contents

Book Tracker

The Book Tracker module aims to enhance the library management system by providing efficient tracking of books, maintaining records of users and their items, and offering a helpful feature to locate and return books to their designated shelves.

1. **Book Tracking:** Students or teachers visit the library to read a book. Library staff use the Smart Library Card to associate the book with the user's profile. The system records the book's details, date, and the user's information.

2. **Book Records:** The system maintains a comprehensive database of books, users, and their history. Each book's status (taken, returned, overdue) is updated in real-time.
3. **Book Location Mapping:** The library layout is digitally mapped with shelves and book locations. Users can access the map through the library's mobile app or online portal. The map displays the exact shelf location, helping users quickly locate their desired genre of book.

4. **Returning Book:** When returning a book, users can refer to the map to identify the correct shelf for the book's placement. Library staff update the book's status as returned in the system.

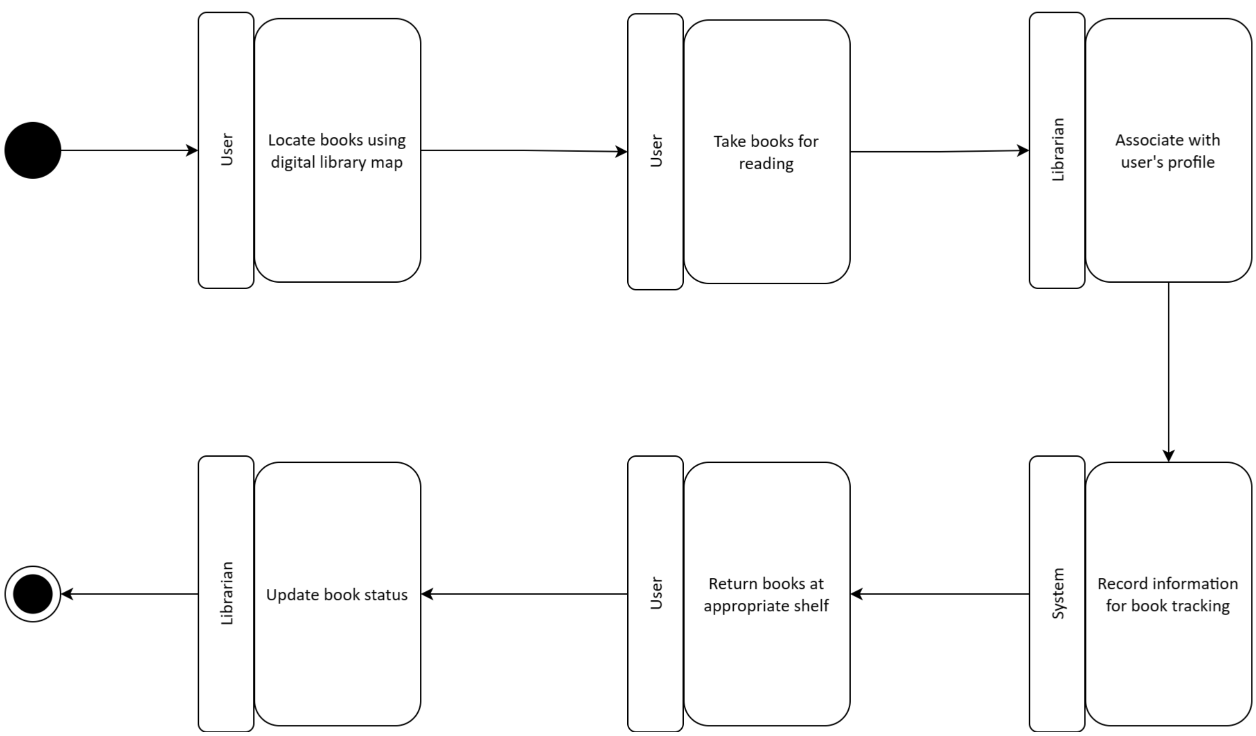


FIGURE-3: Process Flow of Book Tracker

Actors:

1. User (Student, Teacher)

2. Librarian
3. System

Steps	Actor	Description
Take Books	User	Visit the library to take a book
	Librarian	Use the Smart Library Card to associate the book with the user's profile.
Record History	System	Record the book's details, date, and the user's information.
Find Book Location	User	Display the exact shelf location of different book genres, making it easier for users to locate their desired books.
Return Books	Librarian	Update the book’s status.

Electronic Document Handling

The Electronic Document Handling sub-module focuses on the transition from traditional paper-based document handling to a more efficient and organized electronic medium within the library and other departments. By implementing a document management system, this sub-module aims to provide document approval methods in an easier way.

The document management system will provide a centralized and secure repository for storing electronic documents. It will support various document formats, allowing users to upload files such as records, reports, invoices, and other relevant documents. The system will ensure data integrity and security by implementing appropriate access controls and encryption measures.

Once documents are uploaded, the system will provide features such as document scanning, indexing, and categorization. This allows for easy organization and retrieval of documents based on relevant criteria, such as name, document type, or date. Secure sharing among authorized users is facilitated by the system. Users can collaborate on documents by granting specific access rights to individuals or groups. This allows for seamless and controlled sharing of documents, enhancing teamwork and communication among office staff.

To keep users informed and up to date, the system will generate notifications or alerts when new documents are shared or require attention. Users will receive notifications via email, mobile app notifications, or within the system interface itself. This feature ensures that users are aware of any document-related activities or pending tasks that require their attention.

Actors:

1. System
2. Librarian

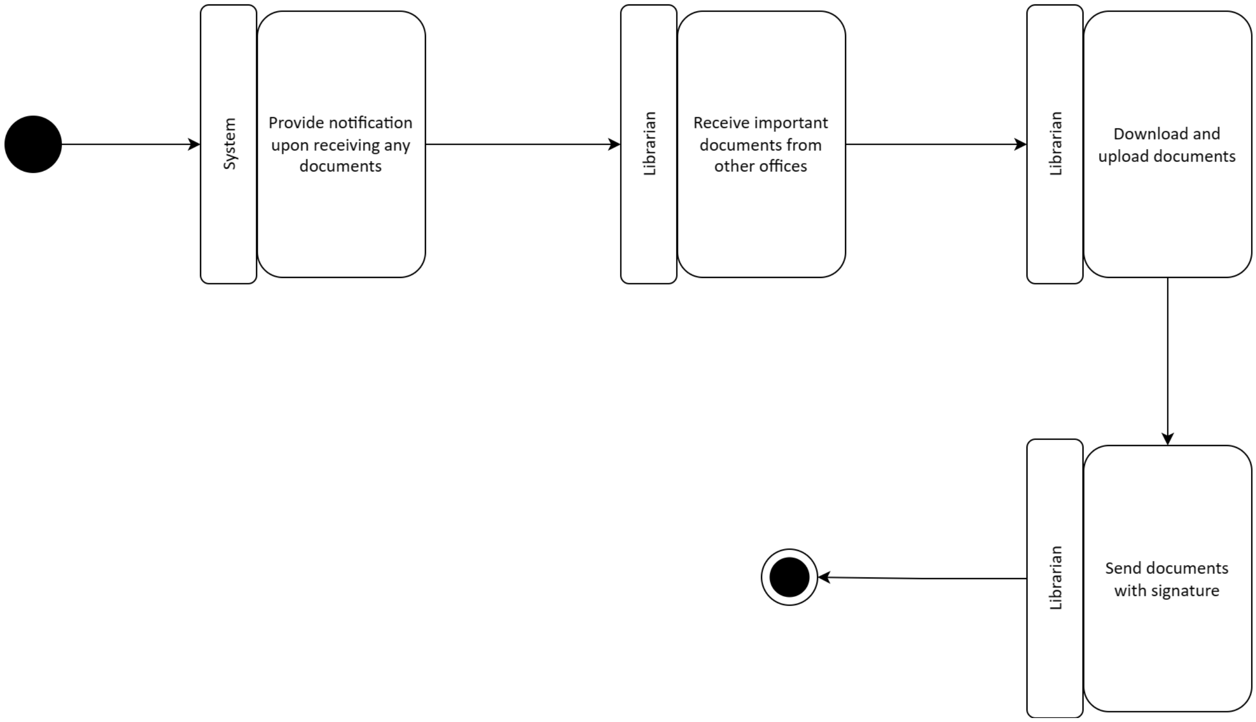


FIGURE-4: Process Flow of Electronic Document Handling

Steps	Actor	Description
Receive Documents	System	Provide notification upon receiving any documents
	Librarian	Receive important documents from other offices
Send Document	Librarian	Download and upload documents with signature to finally send to respective offices

5. Admission/Enrollment

Student Admission

The Academic Section of the University Registrar Office mainly handles the following types of student admissions:

1. Honors 1st year admission test and admission
2. MPhil/PhD student admission and registration and other related stuff
3. Certificate/Diploma course admission and registration
4. BPED admission committee
5. Affiliated colleges and institutes admission committee
6. Admission, re-admission, temporary admission, admission cancellation in 1st-4th year
7. Masters admission, readmission, temporary admission and admission cancellation

The proposed automated student admission system for the university encompasses a unified workflow that caters to various admission types while maintaining a consistent process.

Applicants initiate the process by submitting their applications online, where their details and chosen programs are captured. Admissions committees are assigned according to the specific admission categories, and their role is instrumental in determining eligibility criteria of the candidates. Utilizing these predefined criteria, the proposed system automatically shortlists eligible candidates who are then invited to proceed.

The automated process also integrates a streamlined payment mechanism: candidates submit their payment while applying to take the admission test. Admission tests and vivas, where required, are scheduled and automated, with results seamlessly integrated into the system. The payment process is streamlined through online payment gateways, while document submission and validation are facilitated through the portal.

Admission decisions are inputted into the system by committees, and applicants receive automated notifications of their status. Upon successfully passing the admission test, selected students are prompted to make a further payment for their admission.

The system ensures data accuracy through centralized databases, and automation extends to refund and cancellation processes as well. Reporting and analytics provide insights into admission trends and committee performance. This holistic automation approach not only expedites the admission journey but also ensures a synchronized, error-reduced, and efficient process, enhancing the university's overall administrative operations.

Automated University Student Admission Process (High Level Overview):

Steps	Sub-steps
Online Application Submission	Applicant Registration, Program Selection, Submission of Academic Details
Online Payment	Application ID Generation, Payment Initiation, Display Payment Options, Payment Gateway Redirection, Payment Submission, Transaction Confirmation, Receipt Generation, Payment Status Notifications, Database Update and Reporting, Financial Reconciliation
Applicant Shortlisting	Defining Shortlisting Criteria, Application Data Compilation, Eligibility Check, Applicant Shortlisting, Notification
Admission Test Conduction	Admission Test Arrangements, Test Details Notification, Admit Generation, Admission Test Conduction, Result publication
Enrollment and Documentation	Check Admission Status, Enrollment Form Completion, Admission Fees Payment, Document Submission, Document Validation, Final Enrollment Confirmation, ID Card Generation, Database Update and Reporting, Orientation Registration

Elaborated Description of Each Step

Elaborated description of each of the steps are as follows.

Admission Form Curation

Actors:

- **Admission Committee:** University personnel responsible for designing and curating the admission forms for 1st-year students.
- **Applicants**: Prospective 1st-year students applying for admission to the university.

Steps	Actor	Description
Form Template Design	Admissions Committee	Designs a standardized form template that includes fields for personal information, academic background, program choice, and other relevant details.
Form Customization	Admissions Committee	Based on the specific requirements of different academic programs, the committee customizes the form template by adding or removing fields as needed.
Digital Form Creation	Admissions Committee	Create digital versions of the admission forms, integrating the designed templates.
Form Accessibility	Admissions Committee	The digital forms are made accessible to applicants through the university's online admission portal.

Diagram

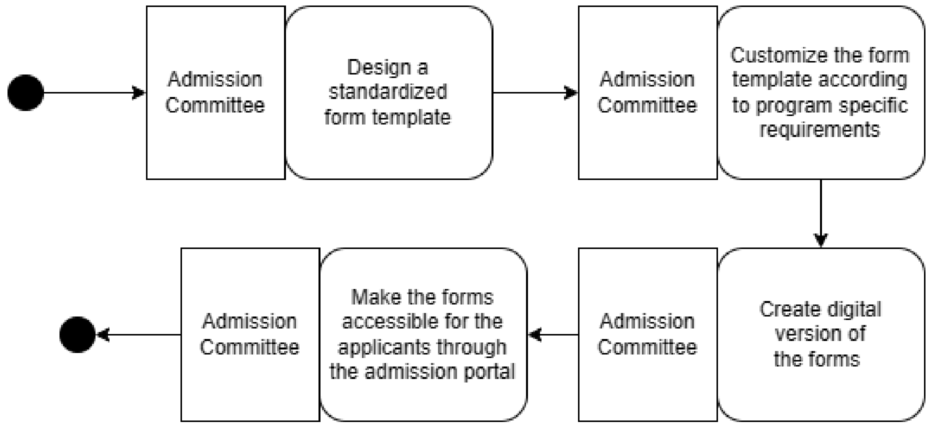


Figure 1: Admission Form Curation

Online Application Submission Process

Actors:

- **Applicants**: Prospective students seeking admission to the university.
- **Admission Committee**: University personnel responsible for defining eligibility criteria and reviewing applications.

Steps	Actor	Description
Applicant Registration	Applicants	Access the university's online admission portal and register for an account.
	Applicants	Provide basic personal information such as name, contact details, and a valid email address.
Program Selection	System	Presents a list of available programs along with relevant details.

	Applicants	Log into their accounts and select the specific academic programs they wish to apply for.
Submission of Academic Details	Applicants	Input their academic information, including scores from SSC and HSC board exams, into the system.
	Applicants	Upload scanned copies of their exam certificates, transcripts, and any other required documents.

Diagram

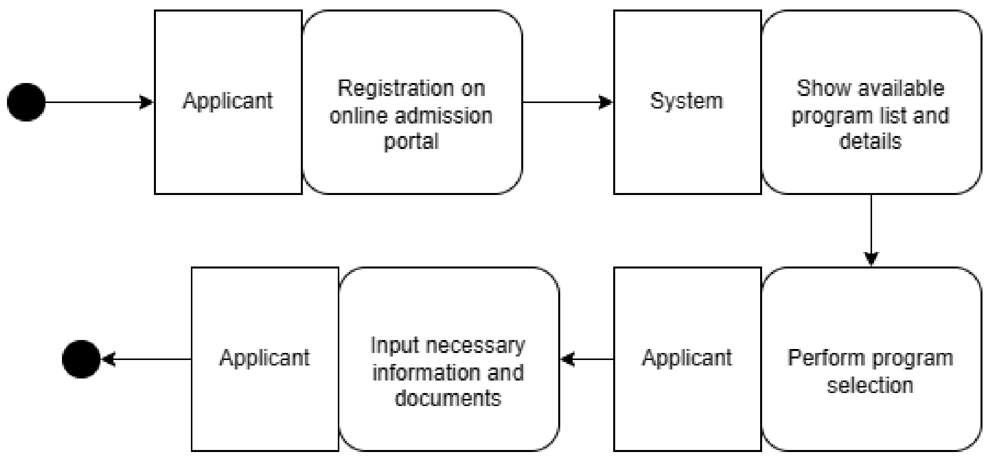


Figure 2: Online Application Submission Process

Online Payment Process

Actors:

- **Applicants**: Prospective students seeking admission to the university, who need to pay the application fees.
- **Payment Gateway Provider**: External service responsible for processing online payments securely.

Steps	Actor	Description

Application ID generation	System	Generates a unique application ID and calculates the application fee based on the selected programs.
Payment Initiation	System	After completing relevant application or admission steps, the system generates a payment request based on the applicable fees
Display Payment Options	System	Generates the breakdown of fees and available payment options (credit/debit cards, online banking, etc.).
Payment Gateway Redirection	System	Applicants are directed to the secured payment gateway's interface to provide payment details.
Payment Submission	Applicants	Enter their payment details and confirm the transaction on the payment gateway's secure page.
	Payment Gateway	Processes the payment securely and confirms the transaction status.
Transaction Confirmation	Payment Gateway	Upon successful payment, the payment gateway sends an instant confirmation to both the applicant and the university system.
Receipt Generation	System	Automated payment receipts are generated, containing details such as transaction ID, amount paid, and timestamp.
Payment Status Notifications	System	Generate and send automated payment status notifications via email or SMS, confirming the successful payment.

Database Update and Reporting	System	All payment-related data, including transaction details and payment status, are stored in a secure central database.
	System	Generates reports for administrative purposes, tracking revenue, and monitoring payment trends.
Financial Reconciliation	Financial Section	reconciles incoming payments with the university's financial records.Any discrepancies are addressed promptly for accuracy and transparency.

Diagram

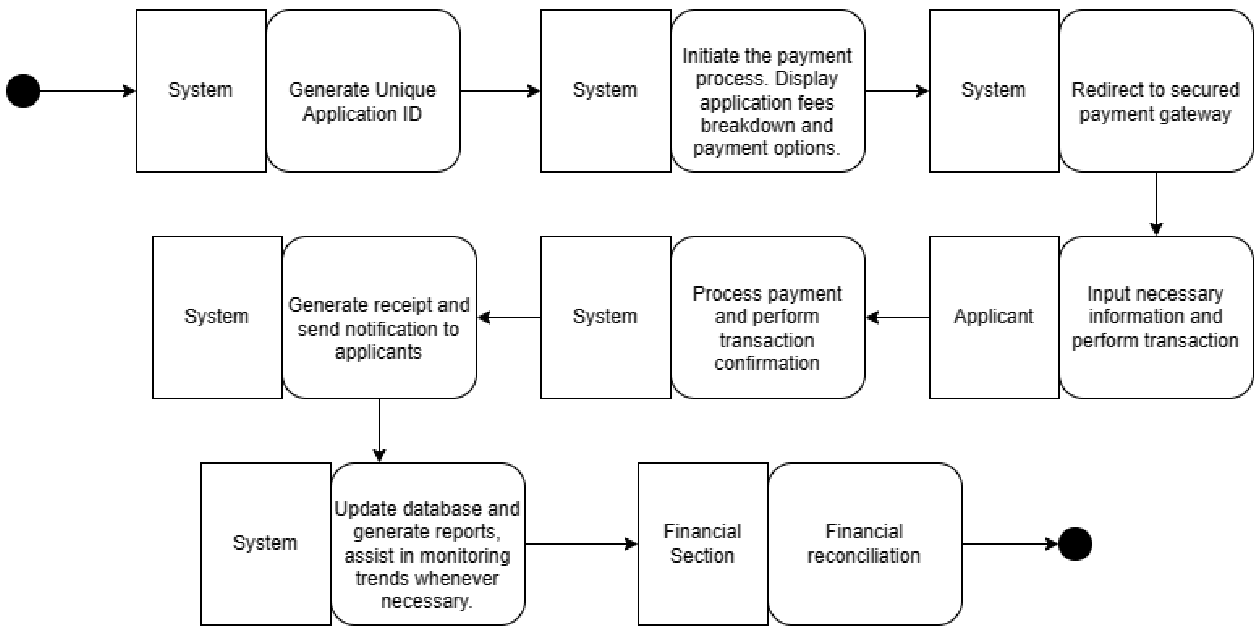


Figure 3: Online Payment Process

Applicant Shortlisting

Actors:

- **Admission Committee**: University personnel responsible for defining eligibility criteria and shortlisting candidates.

Steps	Actor	Description
Defining Shortlisting Criteria	Admission Committee	Defines specific eligibility criteria for each academic program, including minimum GPA requirements and any other relevant criteria.
Application Data Compilation	System	Compiles application data, including academic scores, submitted documents, and chosen programs, into a central database.
Eligibility Check	System	Based on the predefined eligibility criteria, the system automatically calculates the GPA of each applicant from their SSC and HSC board exam scores.
Applicant Shortlisting	System	Generates a list of candidates who meet or exceed the defined GPA criteria for each program.
Notification	System	Automated notifications are sent to shortlisted candidates, informing them of their eligibility for the next stages of the admission process.

Diagram

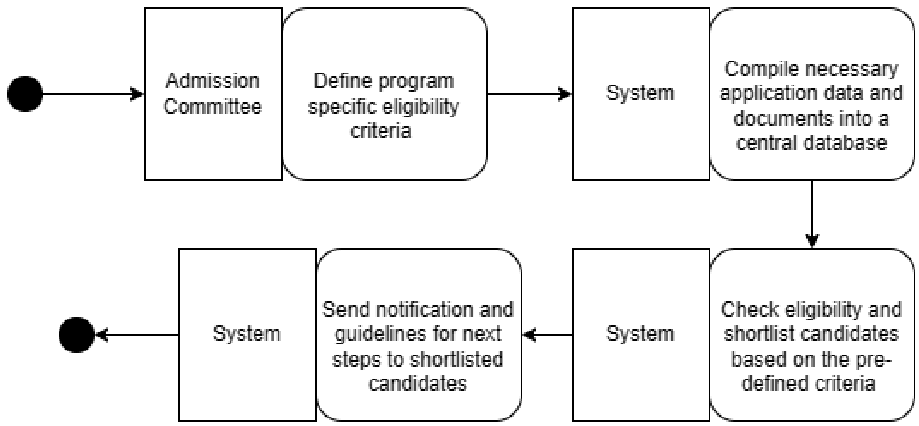


Figure 4: Applicant Shortlisting

Admission Test

Actors:

- **Applicants**: Prospective students applying for admission to specific programs that require an entrance examination.
- **Admission Committee:** University personnel responsible for designing and conducting admission tests.

Steps	Actor	Description
Admission Test Arrangements	Admission Committee	Coordinates with relevant faculty to create admission test questions.
	Admission Committee	Review and finalize the test questions.
	Admission Committee	Make test schedule, venue, and invigilation arrangements
Exam Details Notification	System	After the application deadline, candidates receive automated notifications containing their assigned

		examination date, time, and venue. Information regarding required identification, allowed materials, and examination rules are provided.
Admit Generation	System	Generate admits with specific exam details
	Applicants	Access the university portal to download their admit cards
Admission Test Conduction	Candidates	On the scheduled test date, candidates appear at the designated examination venue with their admit cards and identification.
	Proctors and examination officials	Oversee the test, ensuring a fair and secure environment.
Result publication	System	Notify selected candidates about the result publication date
	System	Once results are finalized, candidates are informed of their scores through automated notifications.

Diagram

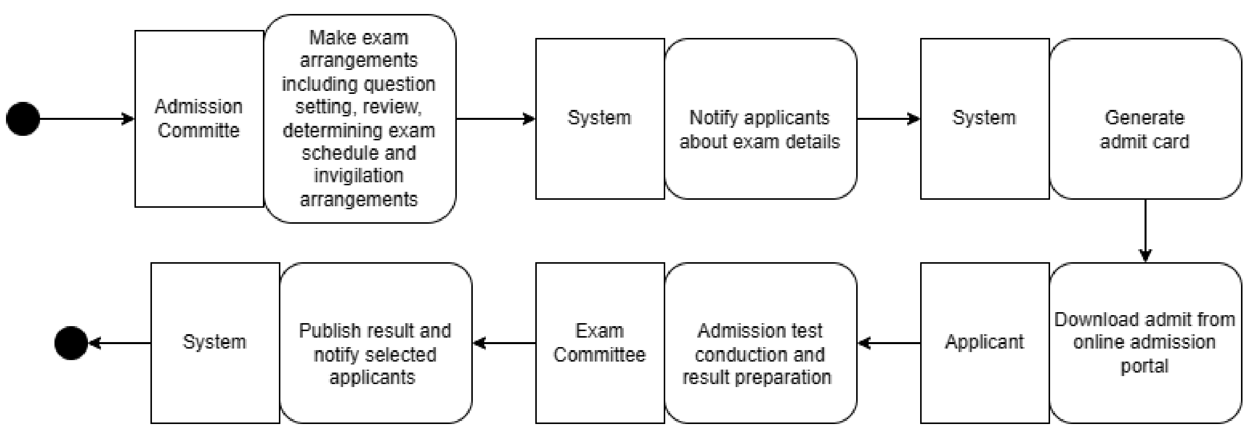


Figure 5: Admission Test

Enrollment and Documentation

Actors:

- **Admitted Candidates**: Students who have been provisionally admitted to the university
- **Enrollment Team**: University personnel responsible for managing enrollment and documentation processes.

Steps	Actor	Description
Check Admission Status	Candidates	Candidates log into their accounts on the university's admission portal and access their admission status
Enrollment Form Completion	Candidates	Candidates are directed to an enrollment form, where they provide additional personal details, emergency contacts, and health information
	Candidates	Select their preferred courses for the upcoming semester or academic year.
Admission Fees Payment	Admission Committee	Publish directions and tution fee braekdown for selected candidates to complete the admission payment process
	System	Provide options for online fee payment through integrated payment gateways. Candidates eligible for financial aid or scholarships can apply through the portal as well.
	System	Update payment status on website
Document Submission	System	Candidates are prompted to upload required documents, such as passport-size photos, proof of identification, and any additional

		documents specific to their program.
Document Validation	Enrollment team	Reviews uploaded documents for accuracy and completeness.
	System	In case of any discrepancies or missing information trigger automated notifications to candidates for correction.
Final Enrollment Confirmation	System	Send confirmation of finalized enrollment status to selected and admitted students, so that they can access their course schedule, fees paid, and important academic dates through the online portal.
ID Card Generation	System	Upon successful validation of documents and completion of enrollment steps, the system generates student identification cards.
Database Update and Reporting	System	Enrollment and documentation details are stored in the central database.
	System	Generates reports for the enrollment team to manage student information and generate necessary records.
Orientation Registration	Candidates	Register for orientation sessions through the portal.
	System	Automated notifications provide details about orientation dates, venues, and necessary information.

Diagram

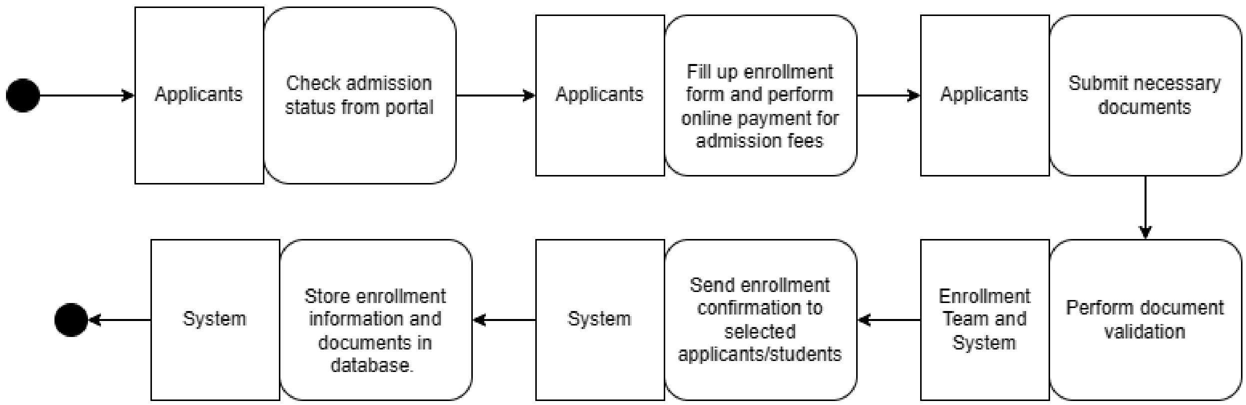


Figure 6: Enrollment and Documentation

6. Recruitment

Teacher Recruitment

Each department is required to establish a standing committee that performs several key functions. Firstly, the committee is responsible for proposing the creation of new positions within the department. Secondly, it is tasked with putting forth recommendations for filling these positions. Lastly, the committee is responsible for selecting the most suitable candidates from the pool of applicants.

Furthermore, this committee is responsible for proposing the composition of the department's selection committee.

The Academic Council is responsible for evaluating and endorsing the new position requests put forth by the department's standing committee, before forwarding them to the syndicate for approval. Once the syndicate grants its approval, the committee then seeks authorization from the UGC (University Grants Commission) to proceed with filling the approved positions.

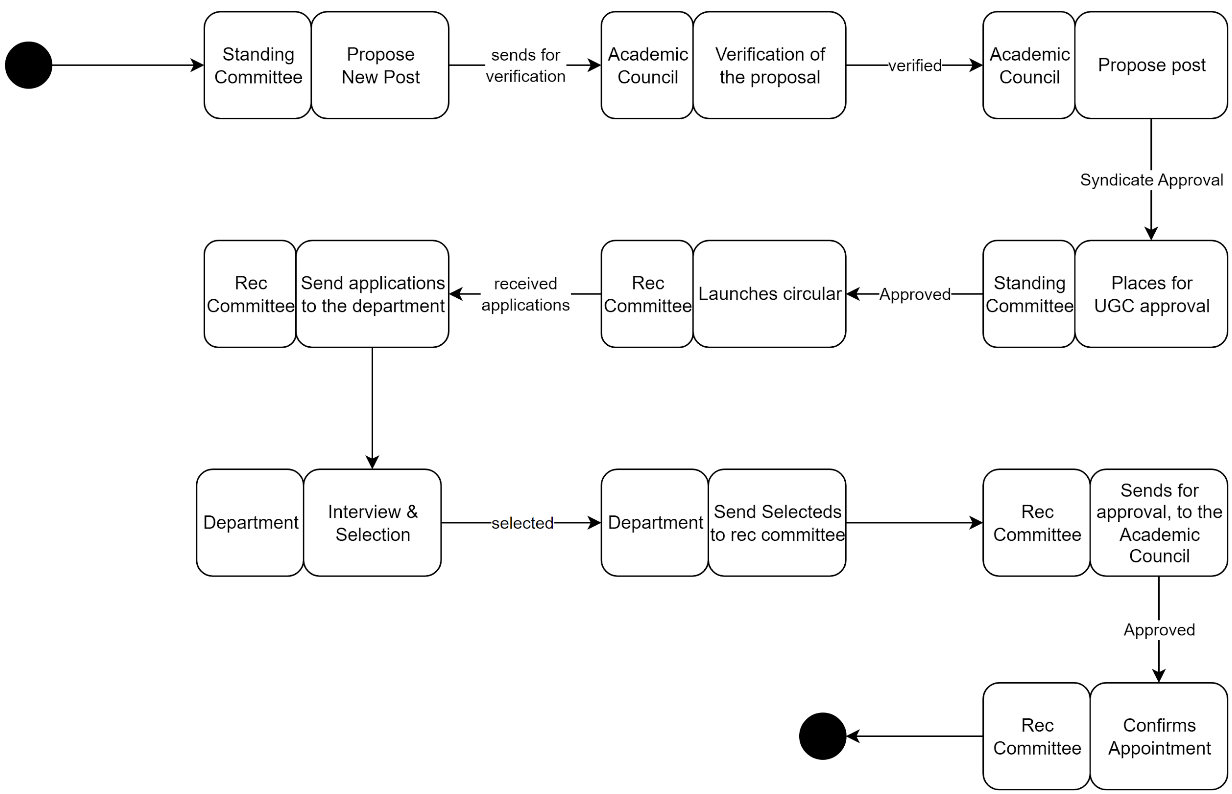
Following the decision of the standing committee, the section of registrar office with the duty to conduct the official process issues a circular to advertise the available positions. Interested individuals submit their applications, which are subsequently forwarded to the department for examination and interview purposes. Upon successful completion of the interview process, the committee assesses the performance of the interviewees and shares the information with the Academic Council for final approval. Once approved, the appointment letters are issued to the successful applicants.

The following process flow can be proposed for the teacher recruitment section:

Steps	Actor	Description
Propose New Post	Standing Committee	Places a new post creation request to the academic council.
	Academic Council	Academic Council verifies the need and possibility of the new post.
	Academic Council	Academic Council proposes the post to the syndicate.
UGC Approval	Standing Committee	After all the approvals the standing committee seeks final approval from the UGC.
Apply	Recruitment Committee	The committee launches a circular to fill the post/s.

	Recruitment Committee	The committee sends the received applications to the respective department.
Selection	Department	Department selects the potential candidates for the post and takes interviews.
	Department	Department sends the selected applicants' information back to the recruitment committee.
	Recruitment Committee	The recruitment committee sends the passing applicants' details to the Academic Council.
	Recruitment Committee	The committee confirms the appointments and sends appointment letters to the joints.

Action diagram for the process flow:



Staff (Officer) Recruitment

The Staff Management section is responsible for overseeing all aspects of an individual's employment, from their initial hiring to their retirement. Additionally, as a subsidiary section, it also handles the recruitment and management of teaching positions, such as the Proctor and the hall Provost.

It is important to note that our Staff Recruitment function is exclusively focused on the recruitment process itself. The creation of new positions follows a separate and intricate procedure that does not fall within the purview of this department. The duties performed by this department can be summarized as follows:

Firstly, all applications for vacant positions are submitted to the Staff Management section. The section then forwards these applications to the respective department or office for review. The office carefully assesses the applications and identifies potential candidates from the pool of applicants. The selected applications are then returned to the Staff Management section.

At this stage, the section seeks clearance from the Vice-Chancellor (VC) to proceed with conducting interviews for the shortlisted applicants. The VC, in collaboration with the syndicate, forms an interview panel and schedules a specific date for the interviews. The Staff Management section contacts the members of the interview panel and sends them an official invitation to join the interview on the designated date.

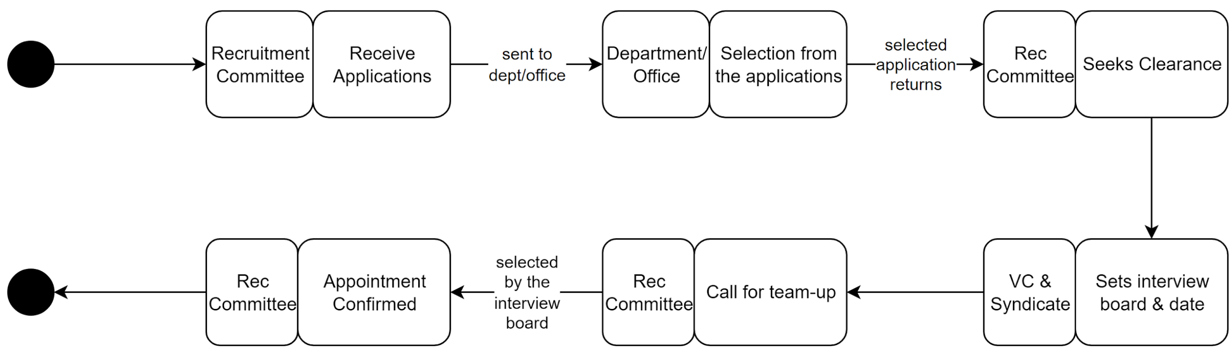
Subsequently, the interview panel evaluates the candidates and makes the final selections for the available positions. The chosen applicants receive appointment clearance from the Staff Management section, and the remaining administrative tasks associated with onboarding the new staff are completed. Finally, the appointed staff members are provided with an appointment letter and proceed to join the respective department in accordance with the instructions outlined in the letter.

The following process flow can be proposed for the staff/officer recruitment section:

Steps	Actor	Description
Apply	Recruitment Committee	Receive the applications come for the post.
	Department/Office	The related department/office selects the most suitable applicants.
Selection	Recruitment Committee	The recruitment committee seeks interview clearance and dates from the VC.

	VC & Syndicate	VC and the Syndicate form an interview conducting team and set up an interview date.
	Recruitment Committee	Recruitment committee calls the VC-selected team and holds the interview.
	Recruitment Committee	The interview selected candidates get the confirmation of the recruitment.

Action diagram for the process flow:



Staff (3rd & 4th class) Recruitment

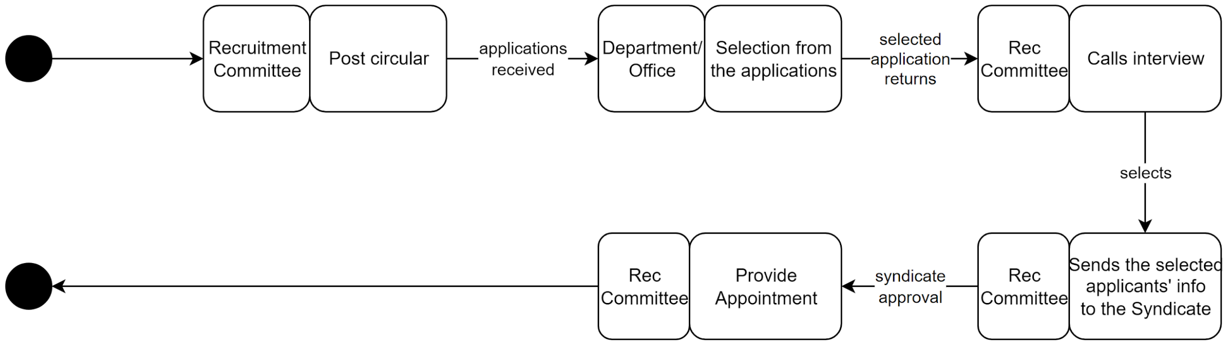
The details pertaining to the newly proposed posts are initially submitted to the syndicate for review and consideration. Subsequently, the syndicate forwards these details to the University Grants Commission (UGC) for further evaluation. If the UGC grants approval, the new post is established, and the committee responsible for such matters issues an official circular to inform relevant stakeholders.

The newly approved posts or, the existing posts, duly approved by the University Grants Commission (UGC), are accompanied by the corresponding circular issued by the section. Subsequently, the details of applicants who have applied for these posts are forwarded to their respective departments or offices affiliated with the concerned post. The department then proceeds to select suitable candidates from among the applicants and submits a formal statement to the committee. The committee, in turn, organizes interviews for the shortlisted applicants. Those applicants who are selected following the interview process are subsequently referred to the syndicate for approval. Upon receiving approval from the syndicate, the files are returned to the section, which then proceeds with the appointment process.

The following process flow can be proposed for the 3rd/4th class staff recruitment section:

Steps	Actor	Description
Apply	Recruitment Committee	Receive the applications come for the post.
	Department/Office	The related department/office selects the most suitable applicants and sends the selected back to the recruitment committee.
Selection	Recruitment Committee	The recruitment committee calls for an interview on a suitable date.
	Recruitment Committee	Selected candidates' information is sent to the syndicate by the recruitment committee.
	Recruitment Committee	Recruitment committee provides the selected' appointments to join their respective department or office.

Action diagram for the process flow:



7. Accomodation

Student Hall

The Student Hall Office is responsible for managing both the academic and residential aspects of student life within university halls. On the academic side, the office handles student registration, endorsement of various forms, and the distribution of hall ID cards. It also provides essential documents such as admission forms, exam forms, scholarship forms, mark-sheets, and certificates. In terms of residential services, the office oversees dining, cleaning, security, room allocation, utilities, library access, and prayer room facilities. Additionally, the office handles budgeting, billing, and communication with other university offices. With automation, the university aims to streamline processes, enhance efficiency, and provide a seamless experience for students in the halls.

Steps	Actor	Description
Hall Attachment	Admission Office, Hall Authority	The Admission Office assigns students to specific halls during the registration process and attaches the information to the student's profile. The assignment is then endorsed by the Hall Authority after verification.
Hall ID Card	Student, Hall Office	Provides hall ID cards, distinguishing between resident and non-resident students.
Exam Form	Student, Hall Office	Provides exam forms and endorses them after verification by the Provost's signature.
Admission Form	Student, Hall Office	Distributes admission forms and endorses them upon submission.
Scholarship Form	Student, Hall Office	Provides scholarship forms and endorses them after verification by the office.
Marksheet & Certificates	Student, Hall Office	Issues mark-sheets and certificates to students after results are declared.

Hall Library Card	Student, Hall Office	Issues hall library cards to enable access to library facilities.
Residential	Student,Hall Office	Manages dining facilities, ensuring proper food services and monitoring meal plans.
		Oversees cleaning services to maintain cleanliness and hygiene within the halls.
		Coordinates with security personnel and guards to ensure a safe and secure environment.
		Manages room allocation for students, including assigning and reallocating rooms as needed.
		Monitors utilities such as electricity, water, and gas supply to address any issues promptly.
		Provides access to the hall library, ensuring students can borrow books and utilize resources.

		Facilitates prayer room access, catering to students' religious needs.
Budget & Billings	Hall Office, Accounts	Handles budgeting and billing processes, including submitting budget requests and invoices to the Accounts Office for financial management.
Administrative Tasks	Hall Office, Register Office	Communicates with the Register Office for specific official needs, such as documentation and administrative requirements.
Others	Hall Office, Student, Medical	Contact the University Medical Office when a student falls sick, ensuring appropriate medical attention and support.
	Hall Office, Student, Department/ Institutes	Collaborates with the respective academic department if disciplinary actions, such as student suspension or expulsion, need to be implemented.

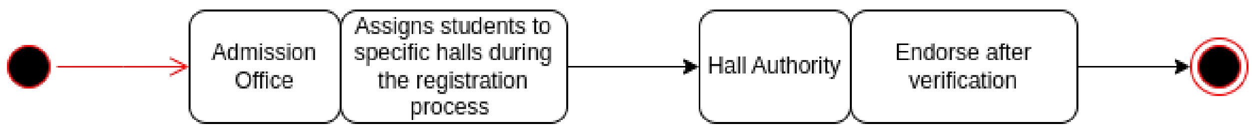


Figure: Hall Attachments

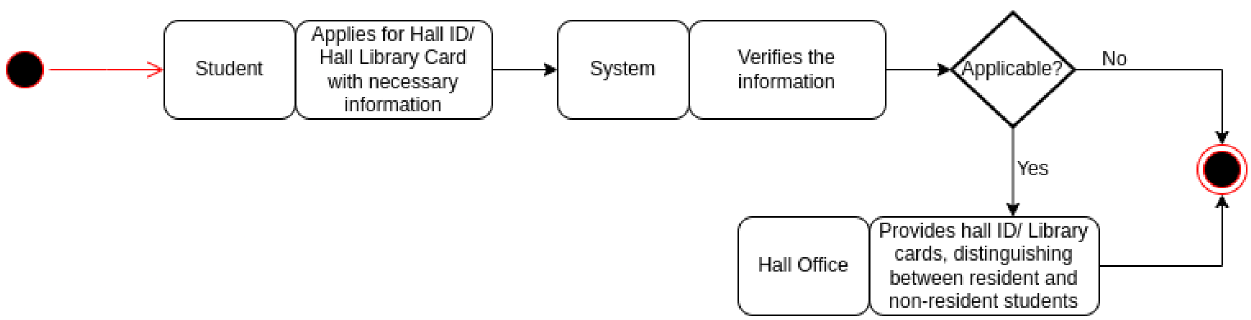


Figure: Issue of Hall ID/ Hall Library ID

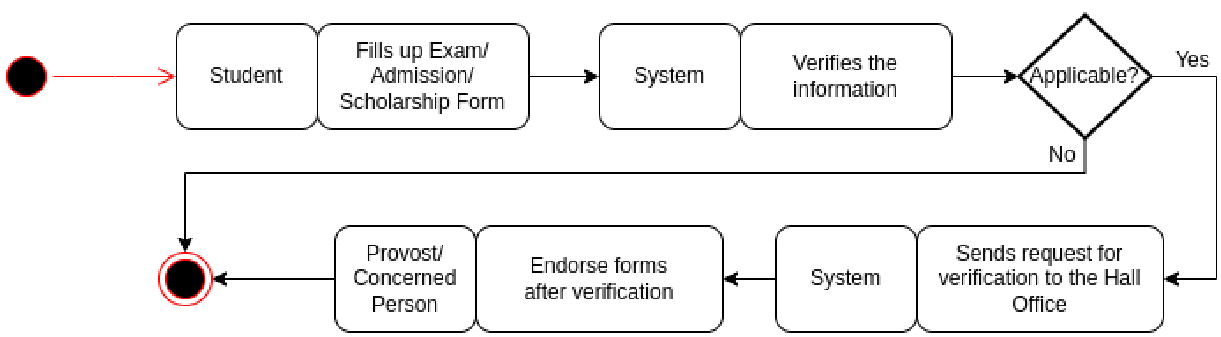


Figure: Exam/ Admission/ Scholarship Form Management

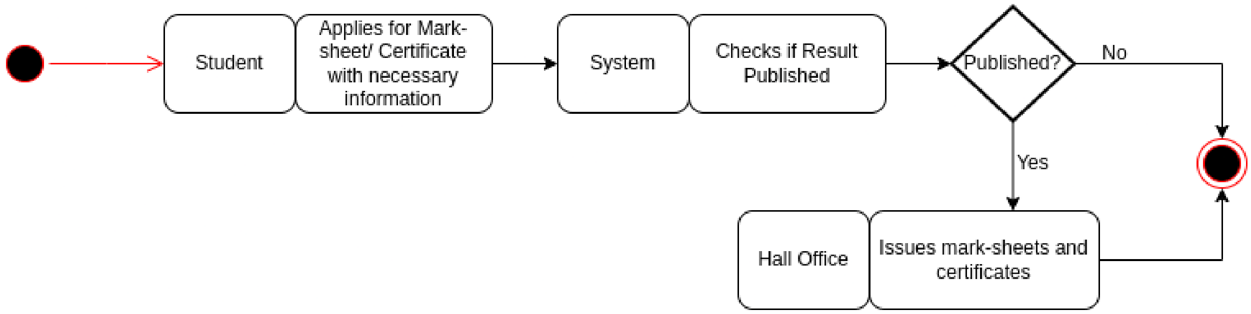


Figure: Issue of Marksheet & Certificate

8. Academic

Departments and Institutes

This module is concerned with the activities and the automation prospect of departments and Institutes. However, the core activities of the department and institute are almost the same for both.
We'll broadly discuss automating the activities for the following sections under department and institute.

1. Course Management
2. Faculty Management
3. Student Management

For all these sections we'll have a common **Dashboard** to access them all. The responsible desk Admin will be able to access all these modules the manage their activities. Below, we've broken down these sections in a detailed manner.

Course Management

The manual process of course management within a university involves various administrative tasks that are carried out by university staff. These tasks include

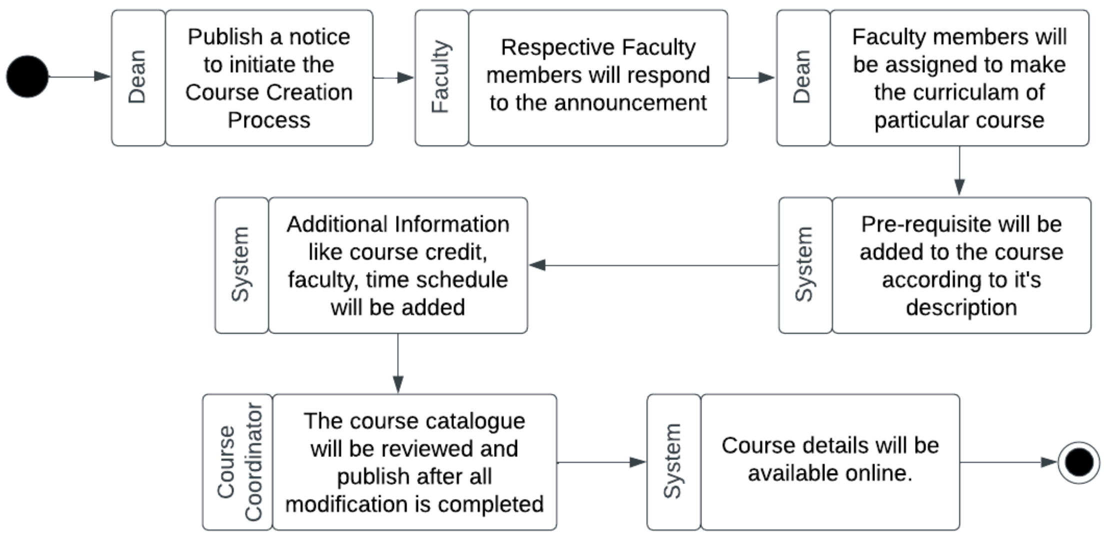
- Course Creation.
- Course Modification
- Course Scheduling
- Communication and Record-Keeping.

Course Creation

In the automatic course creation process the faculty members will initially submit the course details in the system. The system will validate the information and prompt the faculty member to provide the necessary information. After submitting the details, the system will automatically verify the course prerequisites based on the details and will add prerequisites according to the course requirements. Then the course details will automatically be compiled and generate a course catalog including course descriptions, prerequisites, credit hours, and other relevant details.
Later on, the course proposal will be passed to Course Coordinators for review and approval. Each reviewer can access and evaluate the course details along with providing necessary feedback. Once the proposal is approved, the system will automatically assign time slots based on faculty availability, room availability, and other

scheduling constraints. Faculty members, students and other stakeholders can view and access the updated course content online. Any changes in the catalog will be automatically notified to the respective students and faculty members.

Process Flow:

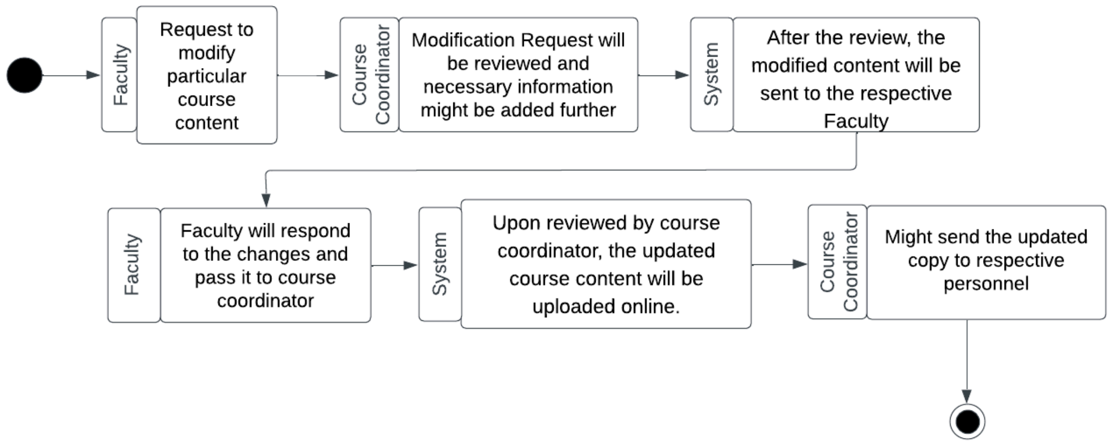


Steps	Actor	Description
Online Course Proposal Submission	Dean	Publish a notice to initiate the course creation process.
	Faculty	After the course creation notice is published, the respective faculty member will respond accordingly. Then the Dean will check and approve the faculty to assign the course-making task to that faculty member. Then the faculty will enter the course details into the system.
	System	The inserted information will be validated and inform the faculty if any field is missing or filled incorrectly.

Automated Prerequisite Verification	System	After the course details are verified, the pre-requisite will be checked according to the course details.
Course Catalog	System	When the course details and pre-requisite are complete, the course catalog will automatically be generated including course descriptions, prerequisites, credit hours, faculty, time schedule and other relevant details.
	Faculty, Students	Faculty and Students can view the course details online.
	Course Coordinator	

Course Modification

Faculty members can submit the modification requests. The request will be passed to the respective course coordinator. S/he will assess the modification and approve or reject the request. S/he can make necessary changes. Upon modification request is reviewed, the faculty member will receive notification from the course coordinator. Once it's approved the course content will automatically be updated. Faculty members, students and other stakeholders can view and access the updated course content online. A copy of the updated course will be sent to relative stakeholders according to course coordinator instructions.



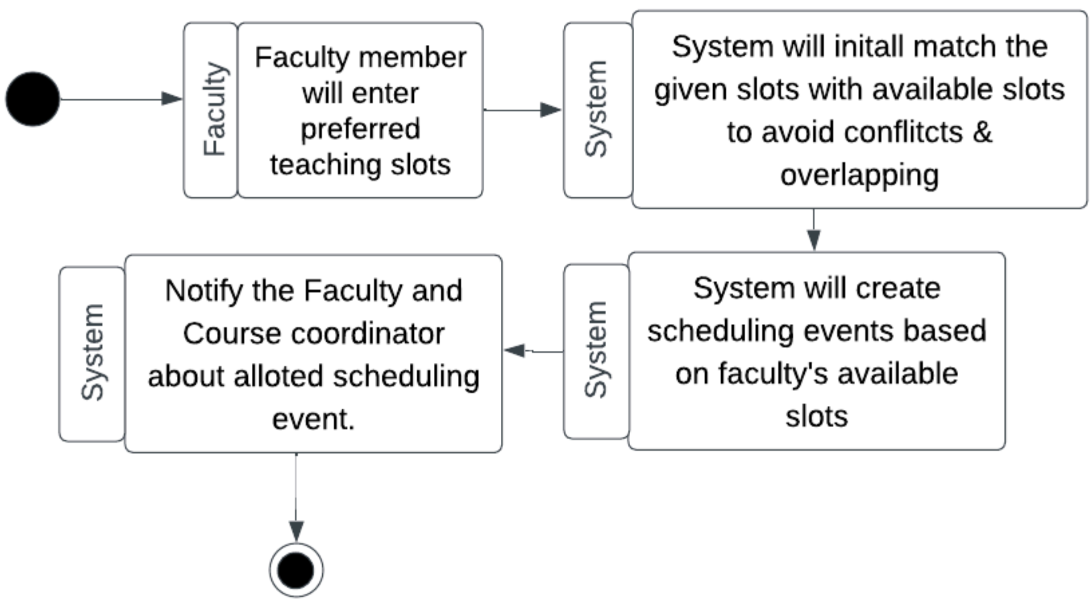
Steps	Actor	Description
Online Course Modification Requests	Faculty	Faculty members can submit the modification request and it'll be passed to course coordinator for further review and approval. This modification request can include course name, description, credit hours, prerequisites, faculty or other details.
Request Approval	Course Coordinator	Upon receiving the request, s/he will review the modification request. Then s/he checks the modification criteria and approves or rejects the request. S/he can also add necessary details.
	System	The changes made by the course coordinator will be sent to respective faculty. Once all changes are done, the request is approved, then the course content will be updated automatically.
Updated Course Details	Faculty, Students	Faculty and Students can access the new course details online. However, they can get the updated course details via mail if the course coordinator wants.

	Course Coordinator	S/he can send a copy of newly updated course content to the students via mail.

Course Scheduling

According to faculty members given slots, the system will automatically assign respective faculties with relevant courses and time slots.

Process Flow:



Steps	Actor	Description
Faculty Availability and Preference Submission	Faculty	Faculty members enter their availability and preferences for teaching slots. It includes preferred days, times or any related constraints.
	System	The system will have an initial time schedule according to an automated scheduling algorithm.

		Upon entering faculty scheduling details, the system will take into account faculty availability, course requirements, room availability, and other scheduling constraints.
Conflict Resolution and Optimization	System	The system will automatically resolve conflicts such as overlapping teaching slots for faculty members or room double bookings. It considers various factors, such as faculty preferences, course requirements, and room capacities, to optimize the timetable.
Notify Stackholders	Faculty, Students	Faculty members and students will receive automated notifications regarding their assigned teaching slots or enrolled courses.

Communication and Record-Keeping

A centralized document management system will be used to store and manage course-related documents. Documents can be easily accessed, shared, and updated by authorized personnel. Any notifications related to add/remove/update of documents will be sent to respective personnel through email. Electronic forms will be used instead of paper-based documents for course change requests, prerequisites, or other administrative processes.

Steps	Actor	Description
Document Management System	Dean, Faculty, Course Coordinator, Students	A centralized document management system for course management will be used to manage and store all kind of course related document to access and manipulate by respective users.

Automated Notification	System	Notifications for course-related updates, changes, and deadlines will be sent automatically.
Digital Records	System	Maintain digital records of enrollment, course changes, prerequisites, and other course-related information.

Faculty Management

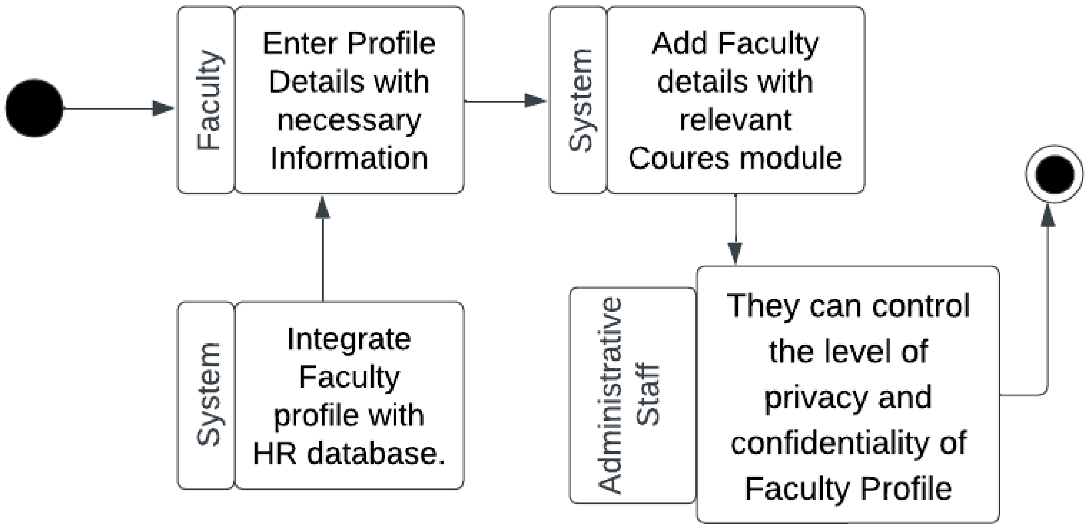
Faculty Management involves different sub divisions that are listed below:

- Faculty Profiles
- Leave Management
- Compensation and Benefits

Faculty Profiles

Faculty members can add their details through an online profile making system. They can efficiently add, remove or edit their details. Faculty profile details will be integrated with the Employe Management System so that relevant personal and employment information can be automatically populated in the faculty profiles. They are allowed to upload digital copies of certificates, degrees, publications, and other relevant documents. Authorized staff can validate faculty profiles.

Process Flow:

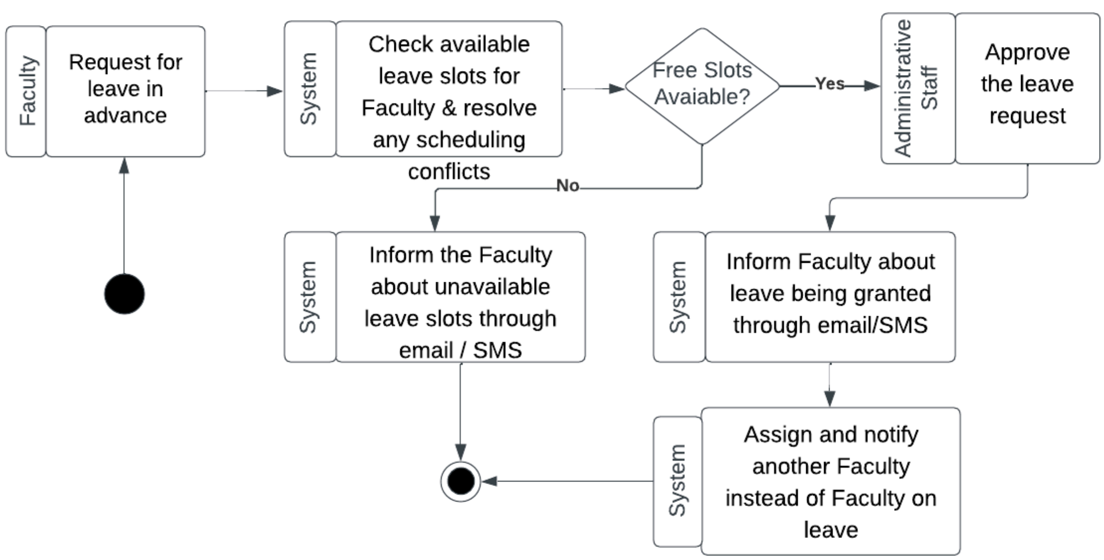


Steps	Actor	Description
Online Profile System	Faculty	Faculty members can create and update their profiles align with the details of their personal information, educational qualifications, research interests, and work experience. They can also upload digital copies of certificates, degrees, and publications.
Integration with HR Systems	System	Faculty profiles are integrated with the HR database. Relevant Faculty info will be automatically populated in the faculty profiles.
Integration with Course Assignment System	System	Faculty profiles will be integrated with relevant courses automatically. It'll help them to automate the process of course assignments.

Profile Visibility Settings	Administrative Staff	They can set the level of privacy and confidentiality of Faculty profiles.

Leave Management

Faculty Members can request for leave online and all the leave related processes are automatically tracked through the system. The system automatically approves leave days from the faculty member's allotted leave days and updates the records accordingly. The system validates leave requests, and enforcing leave policies and rules. The system routes leave requests to the appropriate approvers based on predefined rules. Faculty members are notified about leave approvals, rejections, or requests for additional information. The system automatically identifies available substitute faculty based on their availability and qualifications.

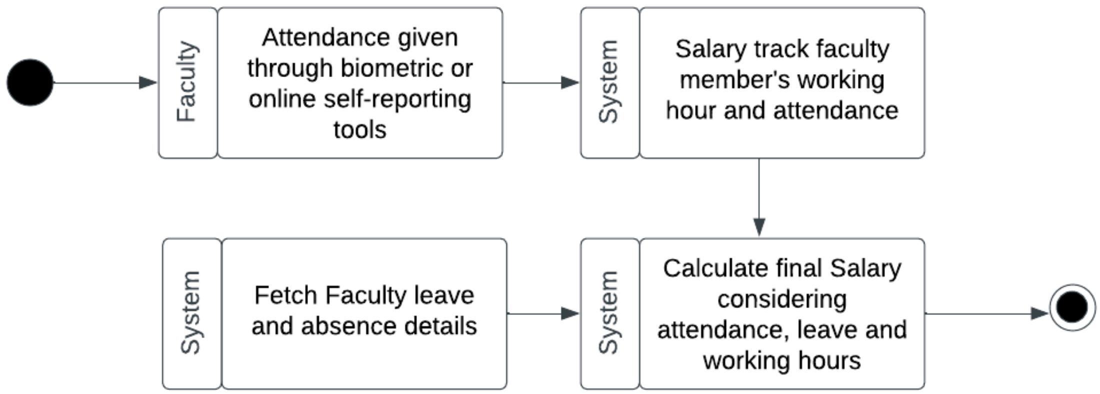


Steps	**Actor**	**Description**
Online Leave Request	Faculty	They will request for a leave in advance online. The request will include details such as leave type,

		duration, reason, and any necessary supporting documentation.
Leave Validation	System	Upon a leave request, the system will check for available leave slots for respective faculty members and verify if there are any scheduling conflicts, overlapping leaves, or leave limits specific to certain periods. When the request is eligible to be approved, it will be passed to a specific Approver. Upon approval, the faculty will receive notification of approved or rejected requests.
	Administrative staff	Administrative staff will then approve or reject the request.
Substitute Management	System	When a leave request is approved, instantly the system will assign another faculty from available substitute faculty based on their availability and qualifications. The assigned faculty will be notified about the new schedule.

Compensation and Benefits

Salary, Bonuses, Overtime and benefits will be automatically managed by the system. Integrated payroll system will handle all of these things. It considers factors such as job position, experience, and qualifications. The system also tracks benefits eligibility, enrollment, changes, and terminations. It deducts leave days from the salary calculation and ensures accurate compensation. The system can make use of online self-reporting tool for tracking attendance. Direct deposit functionality is implemented to automatically transfer faculty payments to their designated bank accounts. The system also generates payment statements for faculty members that are accessible from online.



Steps	Actor	Description
Integrated Payroll System	System	This system will automates salary calculations, allowances, and deductions for faculty members. It considers different factors like job position, experience, and qualifications to handle various compensation components such as base salary, bonuses, overtime, and benefits.
Leave and Absence Integration	System	The system will automatically adjust faculty payments based on approved leaves and absences. It deducts leave days from the salary calculation and ensures accurate compensation.
Time and Attendance Tracking	Faculty	They will provide attendance through biometric systems or online self-reporting tools.

	System	The system will automatically track faculty members' work hours and attendance records.

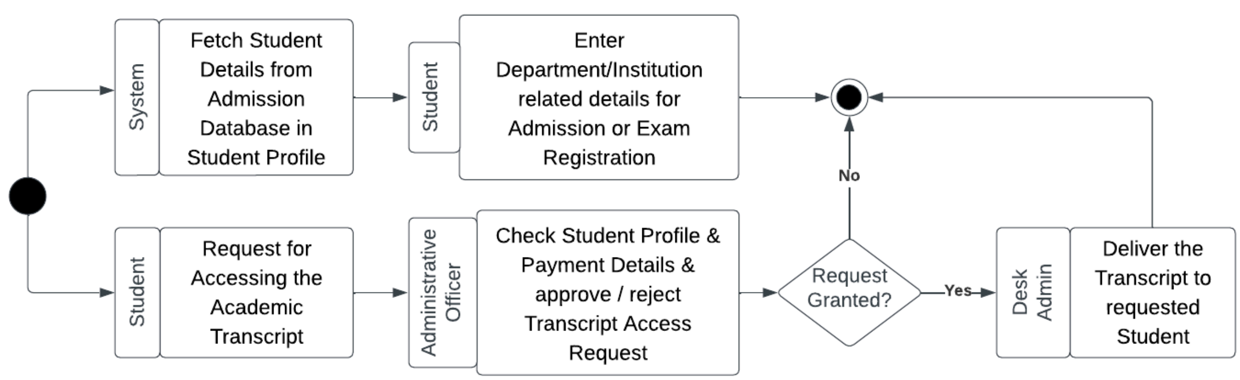
Student Management

Each department and institution have to efficiently handle the cases related to student management. This includes

- Student Record Management
- Readmission Management

Student Record Management

Process Flow:



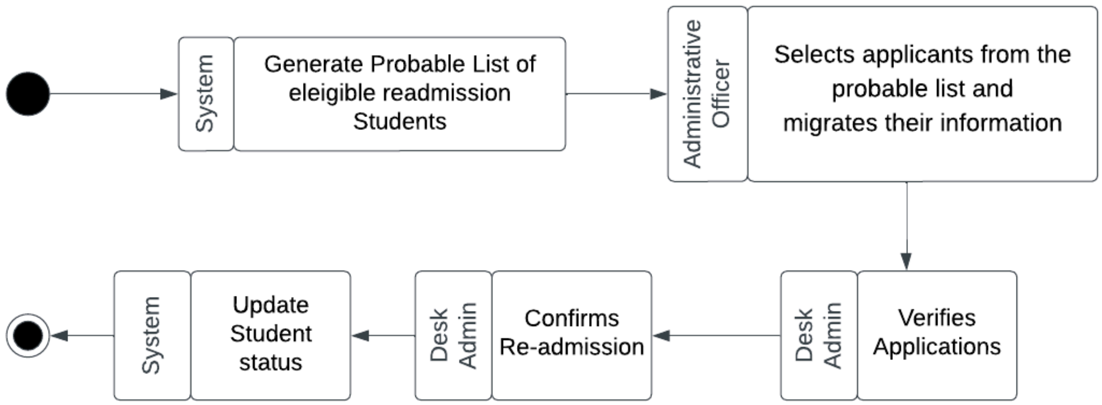
Steps	Actor	Description
Online Student Information System	System	Basic Student details are recorded in time of their admission. System will validate students' details.

	Student	After getting their allotted department, students will enter necessary department or institution related information into their profile. In addition, in times of exam, they will need to provide additional information for downloading their admit card each time.
Online Transcript Requests	Student	Students can request for their academic transcript. Upon specific person approval, they can view or download the transcript
	Administrative Officer	Check Transcript requests and also check for any due payment status. S/he will approve the request for providing the transcript.
	System	Digital Transcript will be secured by adding a digital signature or unique identifier to ensure authenticity.
	Desk Admin	According to individual status of clearance, Transcript will be provided or delayed.

Readmission Management

This sub-module is for students who want to re-admit themselves because they have dropped out or they renewed their registration

Process Flow:



Steps	Actor	Description
Application	System	Generates a probable list of students eligible for re-admission.
	Administrative Officer	[Students who want re-admission apply to their respective institutes and pay their individual fees.] Selects applicants from the probable list and migrates their information from the database. Sends a list of re-admission applicants and pays the total fee via online banking.
Confirmation	Desk Admin	Checks applications and payment status on their Dashboard. Verifies applicants. Enters list of verified re-admits to the system.
	System	Removes the student's dropout status and enrolls them to the appropriate semester.

Centers/Cells

The director of CUCBA is assigned with the responsibility of centers. This responsibility is similar to the responsibility of a chairman of any department. The responsibilities are divided in the sections-

- Academic
- Administrative

Academic Section

The first and foremost task of the center is to select an academic committee at the starting of each year. The academic committee plays an important role in admission management, student enrollment management and exam management.The admission management department fixes the admission date, form fees and upload the forms on the website. The student enrollment department fixes class schedules for the students of different years, fixes courses, and tuition fees. This enrollment is for two types of students-

- For regular students
- For evening courses

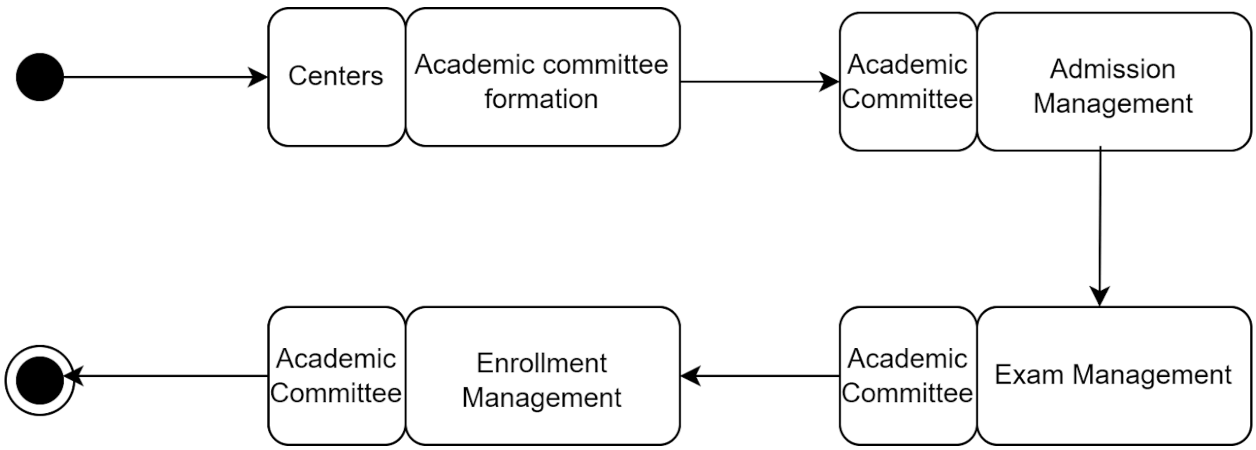
The exam management department first fixes the dates, fix exam fees and publish results via website.

Process flow for academic responsibilities:

Steps	Actor	Descriptions
Academic committee selection	Centers	Assigns some teachers to the academic committee.
Admission Management	Academic committee	Fix date, seat, venues, form fees, upload final forms
Enrollment Management	Academic committee	Fix class schedules, courses, assign teacher to related courses

Exam Management	Academic committee	Fix date, fix exam fees, publish results.

Process flow for academic responsibilities:



Administrative Section

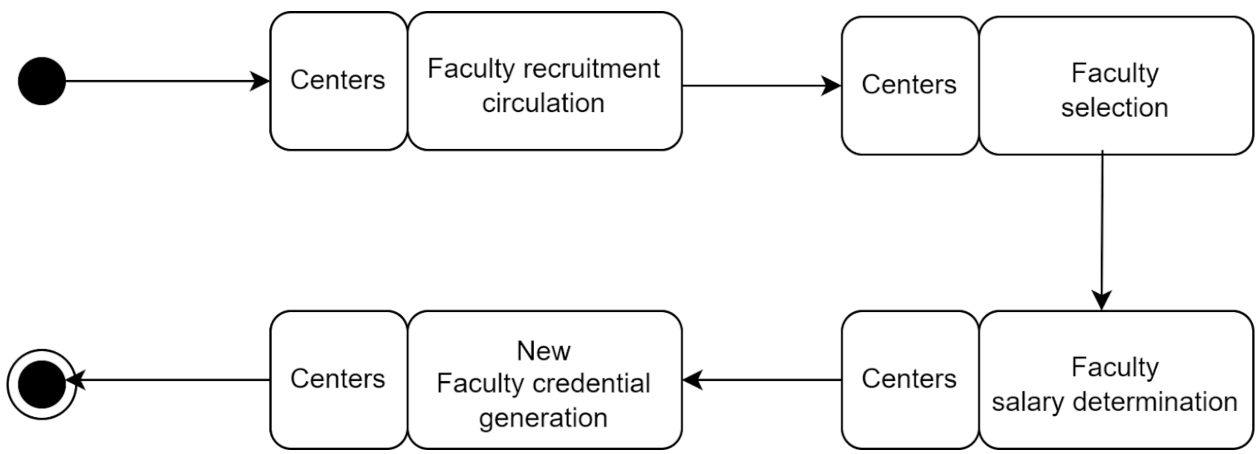
Teacher recruitment, faculty selection, faculty credential generation and store, salary determination are the administrative responsibilities.

Process flow for academic responsibilities:

Steps	Actor	Descriptions
Teacher recruitment circulation	Centers	At the starting of year or any time as per needed the centers circulate the new faculty recruitment notice.
Faculty selection	Centers	The center selects the potential candidates from all the candidates who apply for the post.
New Faculty credential generation	Centers	After faculty selection, the new faculty gets faculty credentials like id, name etc. which are generated by centers.

Faculty salary determination	Centers	The centers set a salary for both new faculties as per budget.

Action diagram for the process flow:



9. Exam Control & Result

Controller of Examinations Office

The Controller of Examinations office works to facilitate the evaluation process of a student's academic progress. So this office handles all the examinations and its related functions of the university except for the admission test and the admission process. The Office handles only the functions of a student after they have registered. The Office has several sections each of which handles an unique purpose.

These are:

1. Letter Distribution Section
2. Result Section
3. Diploma Section
4. MarkSheet Section
5. Form Fillup Section
6. Affiliated Section
7. Store Section
8. Script Section
9. Salary and Attendance Section
10. Information Correction Section

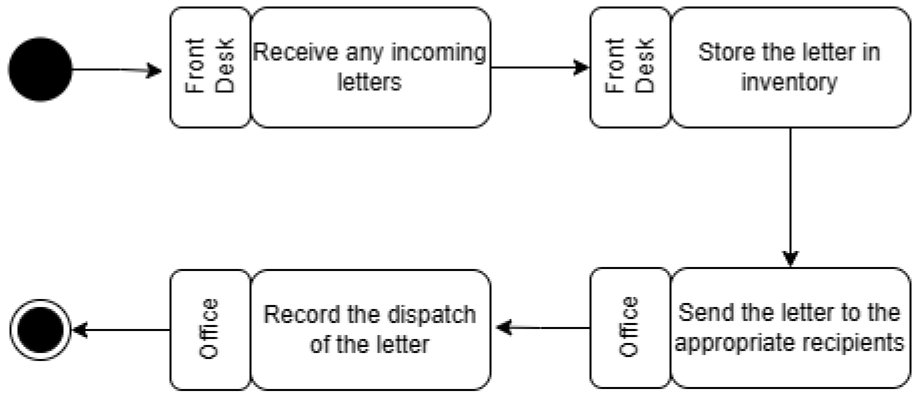
Functionality of the sections are described below:

Letter Distribution Section

The Letter Distribution Department plays a crucial role in managing the controller of the examination office.

At the front desk, the department receives incoming letters. Once received the letters are then stored in the department's inventory. The front desk personnel are responsible for maintaining the store of letters in inventory.

When a letter needs to be sent to a specific recipient within the organization, it is forwarded to the office section of the department. The office personnel carefully review the details and send it to appropriate participants.Then office records the dispatch of the letter.



Process flow for letter distribution :

Steps	Actor	Description
Letter Receive	Front Desk	Receives letter and stores in the inventory
Letter Send	Office	Sends letter to appropriate recipient and keeps the record of letter dispatch

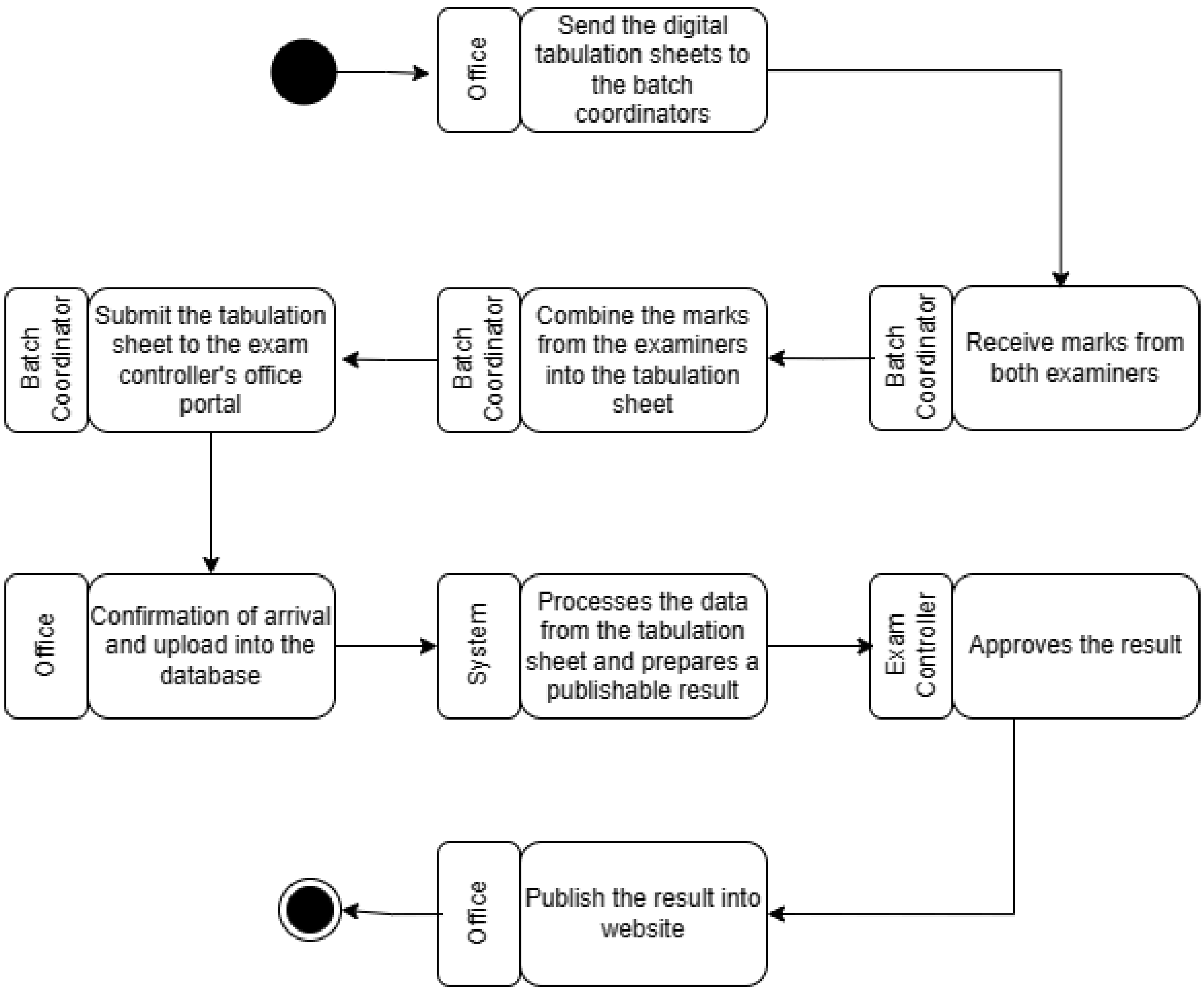
Result Section

The Result section is a crucial component. It encompasses several key stakeholders, including the Office, Batch Coordinators, Exam Controller, and the System.
The process begins with the Office sending the digital tabulation sheet to the Batch Coordinators, who are responsible for collecting marks from the examiners. The Batch Coordinators combine the marks, accurately record them in the tabulation sheet, and then submit it to the Exam Controller's office portal.

Upon receiving the tabulation sheet, the Office confirms its arrival and uploads the data into the result database for further processing. The System then takes over, processing the data from the tabulation sheet and preparing a publishable result. This involves performing necessary calculations, generating grades, statistical information, and presenting the result in a readable format.

The Exam Controller plays a vital role in reviewing and approving the result. They ensure the accuracy and integrity of the data, verifying the calculations.

Once the Exam Controller approves the result, the Office takes charge of publishing it on the organization's website. This enables students or participants to access their individual results conveniently.



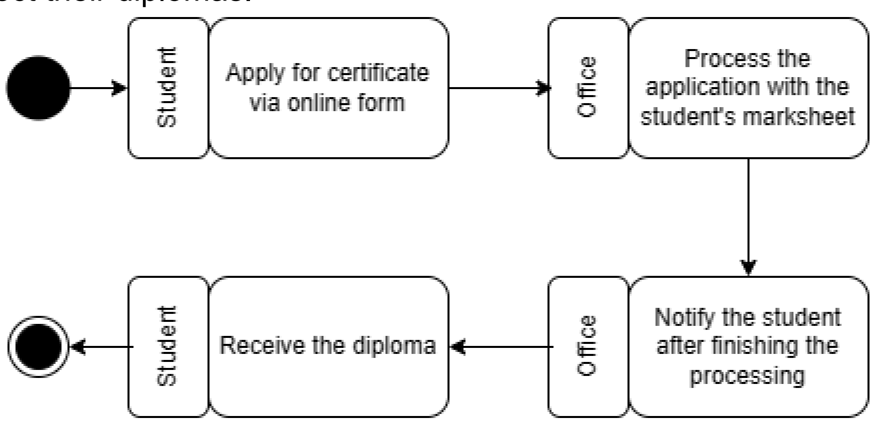
Process flow for Result Section :

Steps	Actor	Description
Tabulation Sheet Processing	Office	Sends the digital tabulation sheet to the batch Co-ordinators
	Batch Co-ordinators	• Receives marks from both the examiners • Combine the marks from the

Steps	Actor	Description
		examiners and write it to the tabulation sheet ● Submit the tabulation sheet to the Exam controller's office Portal
Processing Result	Office	Confirmation of arrival & uploading into database
	System	Process the data from tabulation sheet & prepares a publishable result
Publishing Result	Exam Controller	Approves the result
	Office	Publish the result into website

Diploma Section

The Diploma Department is responsible for managing and facilitating the issuance of certificates and diplomas to students. Students apply for their desired certificate through an online form. The office processes the application, verifying the student's eligibility by reviewing their mark sheet or academic records. Once the process is completed, the office notifies the students about the status of their application. Successful applicants can then collect their diplomas.



Process flow for Diploma Section :

Steps	Actor	Description
Application	Student	Apply for certificate via online form
	Office	Process the application with the student's mark sheet
Diploma	Office	Notify the student after finishing the processing
	Student	Receive the diploma

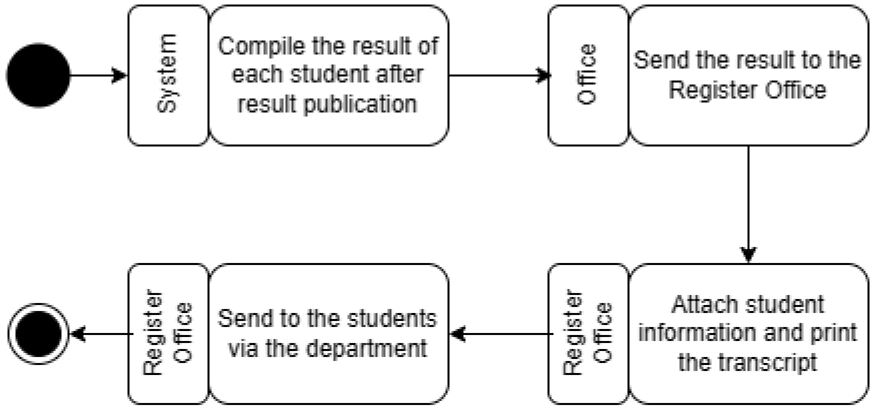
Marksheet Section

Existing System: Students apply for their marksheet and the marksheet section shows them the marksheet.In the mark sheet the top sheet which includes student information comes from the academics office and the marks are confidentially added to the students' mark sheet.Then finally the sheet comes back again to the marksheet section for validation and then send back to the registrar buildings' academics department.

The Mark Sheet Section plays a vital role in managing and processing student result data to generate official transcripts. System compiles the individual results of each student, incorporating grades, marks. This compiled result is then transferred to the Office, which ensures the accuracy and completeness of the data before sending it to the Register Office.

In the Register Office, the result data is further processed. Here, the student's personal information is attached to the compiled result. This includes details such as the student's name, identification number, and subject names. With the integration of this information, the Register Office generates official transcripts.

Once the transcripts are ready, the Register Office takes the responsibility of distributing them to the students. The transcripts are sent through the respective department. This process ensures that students receive their official transcripts, showcasing their educational achievements and providing valuable documentation of their academic journey.



Process flow for Mark Sheet Section :

Steps	Actor	Description
MarkSheet Compilation	System	Compile the result of each student after result publication
	Office	Send the result to the Register Office
	Register Office	Attach student information and print the transcript
Mark Sheet Distribution	Register Office	Send to the students via the department

Recruitment Section

The Recruitment Section is a crucial department involved in the process of recruiting examiners for examinations.
In this section, the department proposes an exam committee for the department and the recruitment section sends it to the vice chancellor office for approval.After approval of the vice chancellor office recruitment section the recruitment section gives cards to the teachers.

If a teacher applies for foreign clearance, the Office checks whether they are scheduled for examiner duty. If the teacher is not assigned to any duty, the Office grants them the necessary clearance. However, if the teacher is already scheduled for examiner duty, the Office asks for a recommendation for a suitable replacement. If a replacement is identified, the Office grants the foreign clearance. In the absence of a replacement, the Office cannot grant clearance.

After the examination, teachers who served on the Exam Committee can claim a bill for their duty. The Office verifies the bill to ensure its accuracy. Once verified, the Office sends the bill to the Accounts Department for further processing.Teacher then can claim the bill.

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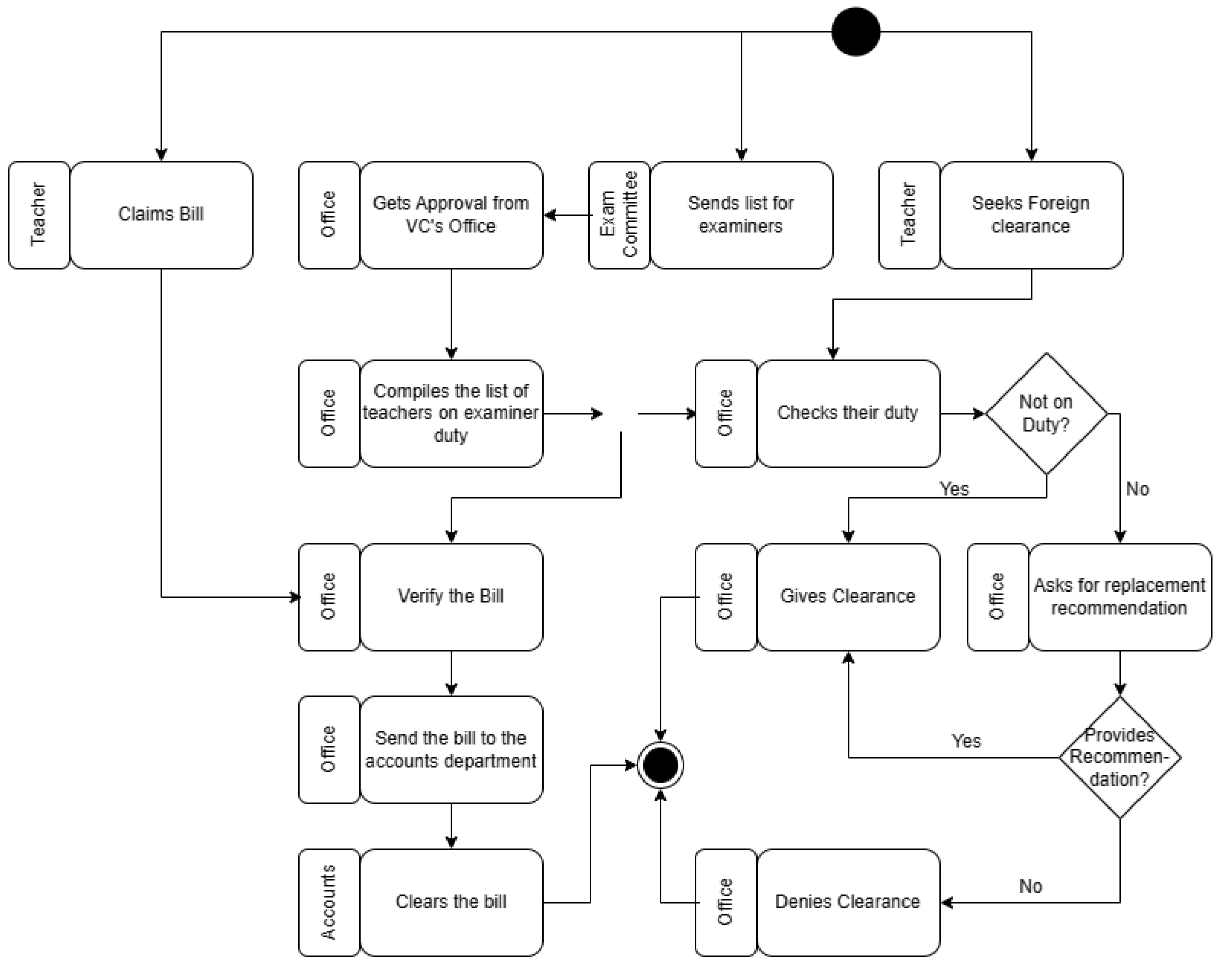


Process flow for Recruitment Section:

Steps	Actor	Description
Exam Committee	Exam Committee	Sends list of examiners to Recruitment Section
	Office	• Gets Approval from VC's Office • Compiles the list of teachers on examiner duty
Foreign Clearance	Teacher	Applies for foreign clearance

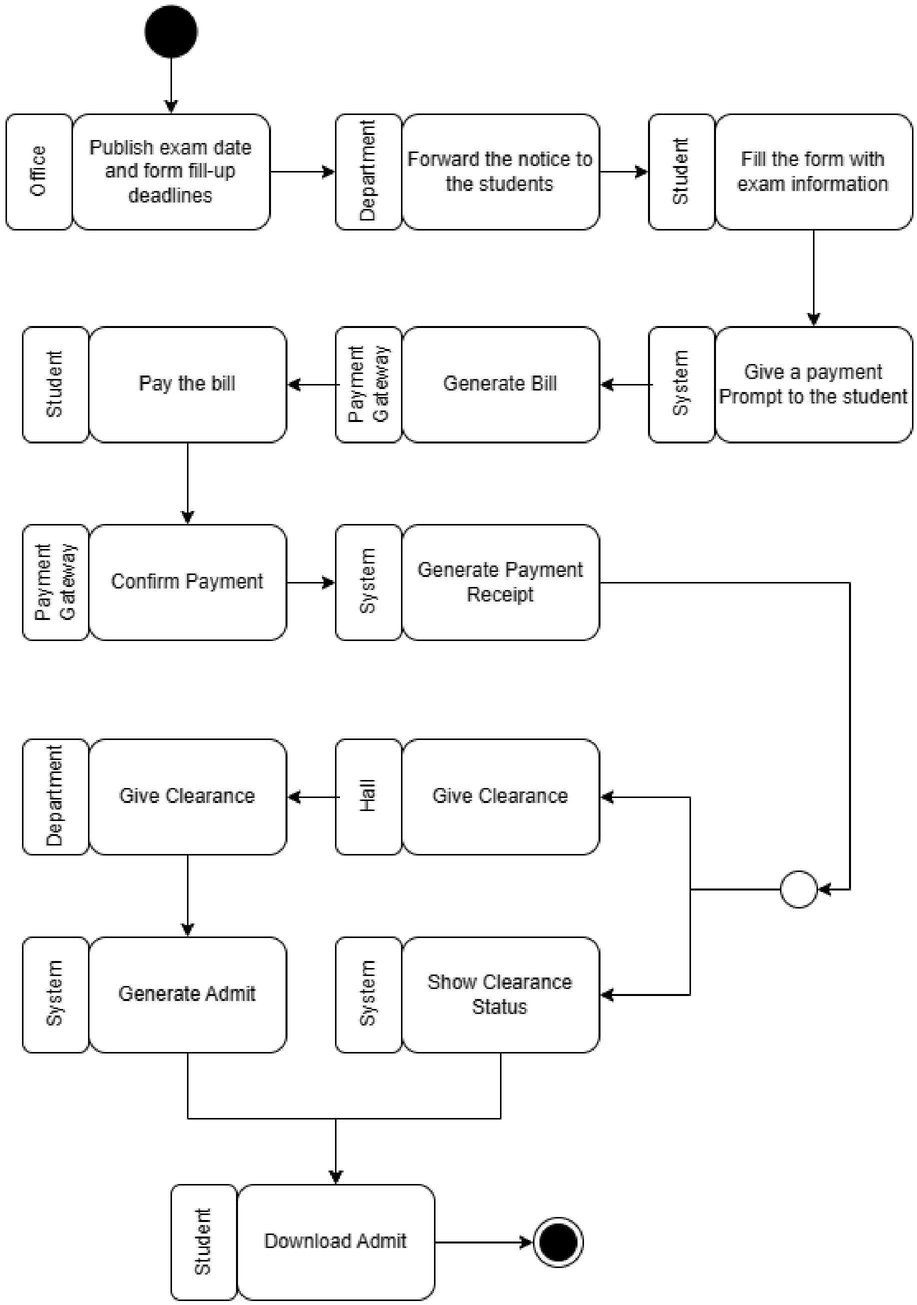
	Office	• Checks their duty
		  ○ If not on duty,gives clearance
		  ○ If on duty:
		    ■ Asks for Replacement Recommendation
		      • If replacement

		found,gives clearance ● Else doesn’t give clearance
Bill Clearance	Teacher	Claims bill for exam committee duty
	Office	● Verify the bill ● Send the bill to accounts department
	Account	Clears the bill

Form Fillup Section

Existing System: Students pick forms from departments and then fill it and submit it to the hall. Again send it to the bank.Bank then send the form to the account department and account department finally sends it to the Controller office.It has 2 subsection.one for all the departments of the university and another for other affiliated colleges such as nursing college,medical colleges ,engineering colleges etc.

The Form Fillup Section is responsible for managing the process of the exam form fillup part. The Office publishes the exam date and form fillup deadlines, providing students with the necessary information to proceed. The Department then forwards the notice to the students, ensuring that they are aware of the upcoming exams and the required form fill up process.
Students fill out the exam form with the necessary exam-related information and proceed to make the payment as per the prescribed fees. The Payment Gateway comes into play, generating the bill and confirming the payment made by the student. The System prompts the student to make the payment and generates a payment receipt as proof of the transaction.
Upon successful payment, the Hall and Department verify and give clearance to the student, confirming their eligibility to sit for the exam. The System generates the admit card. The clearance status is also shown, indicating that the student has fulfilled all requirements. Students then have the option to download their admit card.



Process flow for Form Fillup Section :

Steps	Actor	Description
Exam Notice	Office	Publish exam date and form fillup deadlines

	Department	Forward the notice to the students
Form Fillup	Student	• Fill the form with exam information • Bill payment
	Payment Gateway	• Generate Bill • Confirm Payment
	System	• Give a payment Prompt to the student • Generate Payment Receipt
Clearance & admit	Hall	Give Clearance
	Department	Give Clearance
	System	• Generate Admit • Show Clearance status
	Student	Download Admit

Affiliated Section:

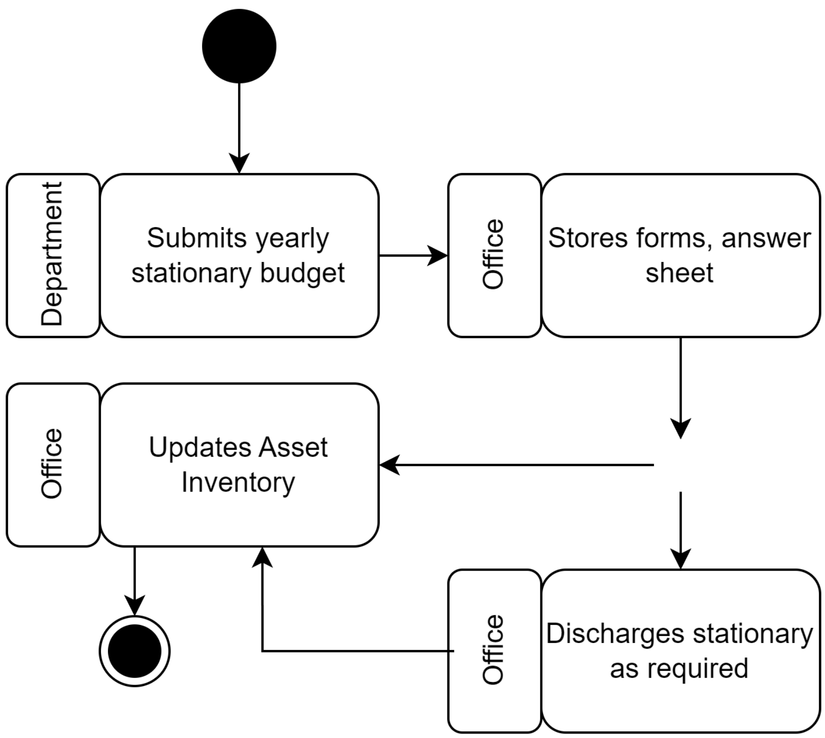
Existing System: Affiliated section works with affiliated colleges such as Nursing colleges,Medical colleges. Affiliated college students pick forms from college and then fill it and submit it to the bank.Bank then send the form to the account department and account department finally sends it to the Controller office.It has 2 subsection.one for all the departments of the university and another for other affiliated colleges such as nursing college,medical colleges ,engineering colleges etc.

Store Section

Existing System: The store section sends letters to every department to enquire about how many papers,extra papers they will need.The department gives a requisition and the store section grants the required number of papers/computer inks needed.

The Store Section is an integral part for managing and maintaining the inventory of stationary supplies.
The Department submits the yearly stationary budget to the Store Section, providing an estimate of the stationary requirements for the upcoming year. The Office, in turn, takes

charge of storing various forms and answer sheets, ensuring their availability when needed.
As per the requirements of different departments, the Office distributes stationary supplies from the inventory. This includes providing forms, answer sheets, and other stationery items as requested. Additionally, the Office updates the Asset Inventory to keep track of the stationary items being disbursed, ensuring accurate records of the inventory.



Process flow for Store Section:

Steps	Actor	Description
Storage Update	Department	Submits yearly stationary budget
	Office	• Stores forms, answer sheet • Discharges stationary as required

		• Updates Asset Inventory

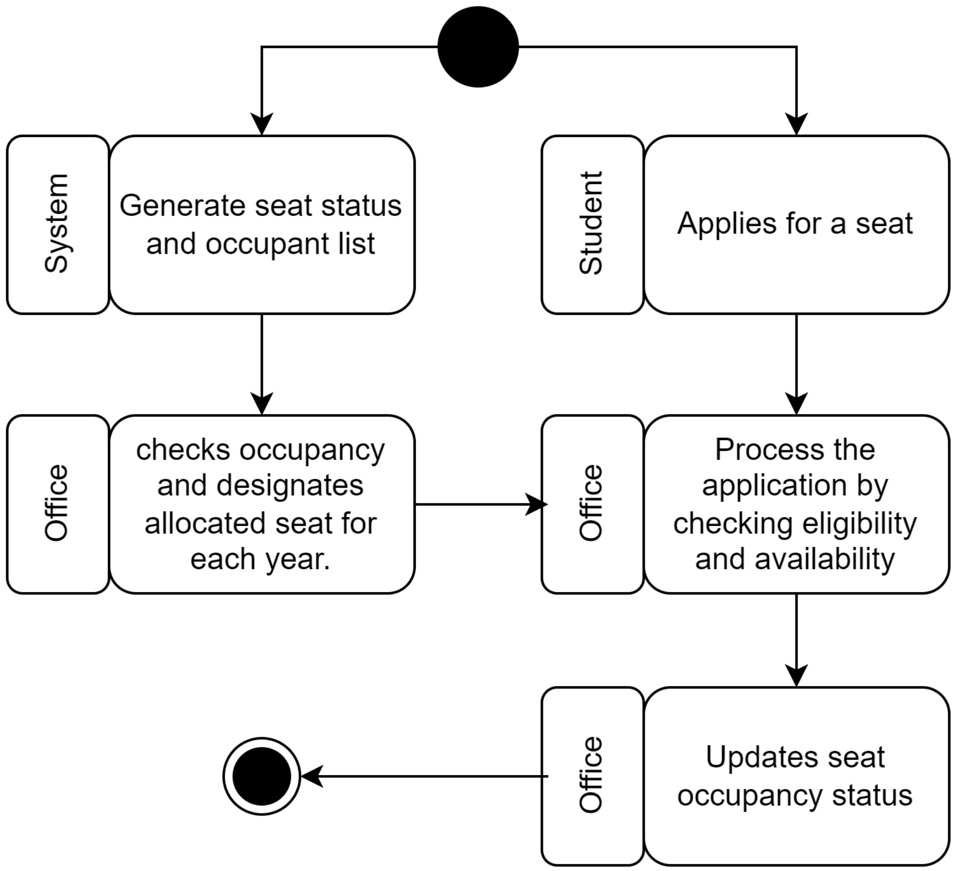
Script Section

Existing System: Examiners after checking scripts send the marks to 3 departments.one to Script section another to Exam committee chairman and the last one to work on tabulation sheet. The Script section's responsibility is to store the marks in a sealed envelope according to the date and subject.If any student wants to challenge the marks then the script section shows them

The Script Section is responsible for storing and retrieving script sheets or information as needed. Examiners after checking scripts send the marks to 3 departments.one to Script section another to Exam committee chairman and the last one to work on tabulation sheet.

The Script section's responsibility is to store the marks in a sealed envelope according to the date and subject.If any student wants to challenge the marks then the script section shows them

When a student or teacher needs access to specific script sheets or information, they submit a request to the Script Section. The Office receives these requests and retrieves the requested script sheets from the archive.



Process flow for Store Section:

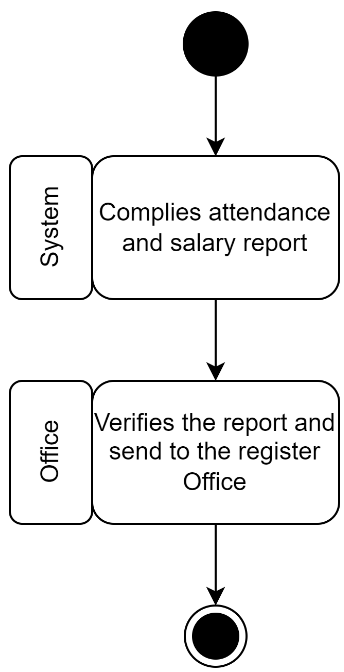
Steps	**Actor**	**Description**
Store Number Sheet	Office	Stores 3 number sheets to an archive by date
	System	updates inventory and log
Recheck Application	Student/ teacher	Submit request for the information Request for the information
	Office	retrieve from archive

Salary and Attendance Section

Existing System: The attendance record is currently being kept at an attendance book manually and their salary bill for the Register Office to be approved and cleared by the Accounts.

This section works to ensure and facilitate the correct report of employee attendance and their salary bill for the Register Office to be approved and cleared by the Accounts. The attendance record is currently being kept at an attendance book manually but could be automated by using a biometric/ near-field communication system.

This section only handles the salary and attendance of the employees who are employed in this Office.



Process flow for Salary and Attendance report Section :

Steps	Actor	Description
Attendance count	System	Complies attendance and salary report
	Office	Verifies the report and send to the register Office

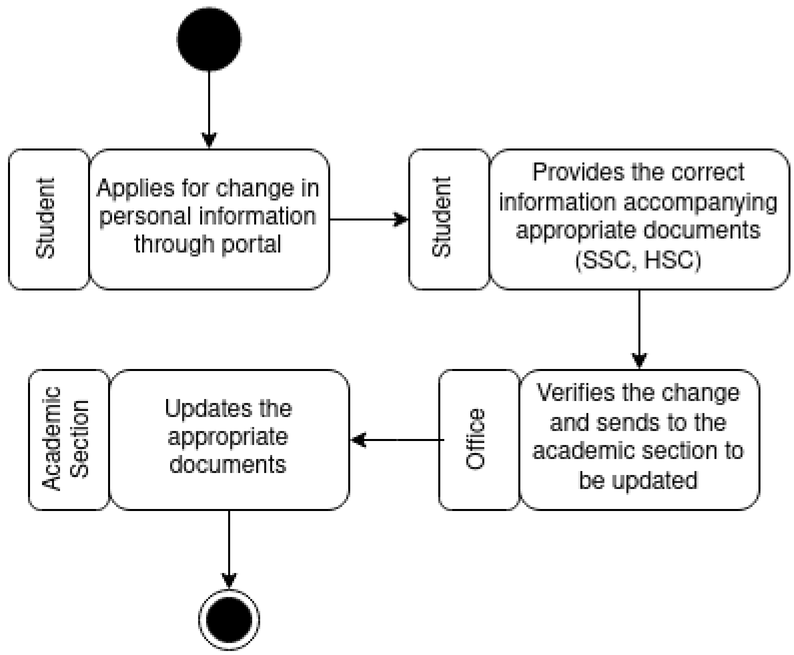
Central Desk Pass

Existing System: Desk pass section is important for the system where the university keeps communication with departments, affiliated colleges and other universities.Desk pass section sends marksheet & certificate to departments and halls,or any student needs correction on his certificate then this section sends the application to the department chairman and also sends thesis papers to different departments.

Information Correction Section

Existing System: Information correction system corrects mistakes in the students' information according to the national/ssc/hsc certification .After authentication , they send it to the academics section.

The Information Correction Section is responsible for managing and processing requests from students regarding changes or corrections to their personal information.
When a student identifies a need to change their personal information, such as their name,parents name, they apply for the change through the institution's portal. The student provides the correct information along with, such as their SSC (Secondary School Certificate) or HSC (Higher Secondary Certificate).
The Office receives the request and proceeds to verify the change and the accompanying documents. They ensure that the correct information and necessary documents have been provided by the student. Once the verification is complete, the Office sends the request to the Academic Section, which is responsible for updating the student's information across appropriate documents and records.
The Academic Section takes the verified request and proceeds to update the relevant information.



Process flow for Information Connection Section :

Steps	Actor	Description
Applies for correction	Student	Applies for change in personal information through portal
	Student	Provides the correct information accompanying appropriate documents (SSC, HSC)
	Office	Verifies the change and sends to the academic section to be updated
Correction	Academic Section	Updates the appropriate documents

10. Security

Proctor Office

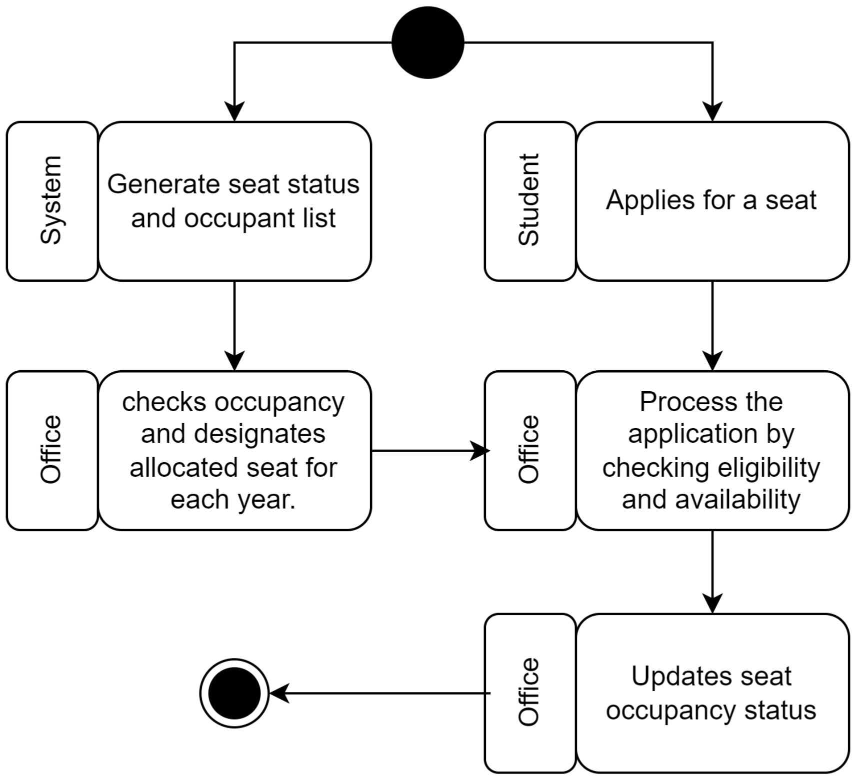
Proctor's office is responsible for ensuring security and taking disciplinary actions against students. The office is also responsible for looking after student welfare. The office has several underlying committees. Among them the disciplinary committee, mental health committee, admission test helpline, anti-ragging helpline, seat allocation committee etc. As the office is responsible for ensuring physical security and disciplinary actions, there is little room for automation except for the seat allocation system and keeping students' records and disciplinary history.

The seat allocation committee is not technically under this office but rather is an independent committee. When allocating seats, the committee at first evaluates vacant seats in the halls. Then they ask for student applications. When allocating seats, the committee evaluates multiple criterias. Firstly they allocate vacant seats for each year in a fixed proportion. Then considering the student's result, financial status and previous disciplinary records, the committee allocates the seat to appropriate students. But as there are thousands of students applying for hall seats, the entire selection process is very cumbersome and consumes a lot of time and manpower.

Seat Allocation Section

The Proctor Office plays a crucial role in managing seat assignments in student’s hall. When a student applies for a seat, they submit an application to the Proctor Office. The Office then processes the application, checking the student's eligibility and availability of seats. They ensure that the student meets the necessary criteria and that there are vacant seats to accommodate their request.

Simultaneously, the System generates a seat status and occupant list, providing an overview of the available seats and their current occupants. Once the Office verifies the student's eligibility and determines seat availability, they update the seat occupancy status accordingly. This ensures that the seat assignments are up-to-date and reflects the current occupancy status of each seat.



Process flow for Seat Allocation :

Steps	Actor	Description
Seat Allocation	Student	Applies for a seat
	Office	Process the application by checking eligibility and availability
Occupancy status	System	Generate seat status and occupant list
	Office	Updates seat occupancy status

Security Office

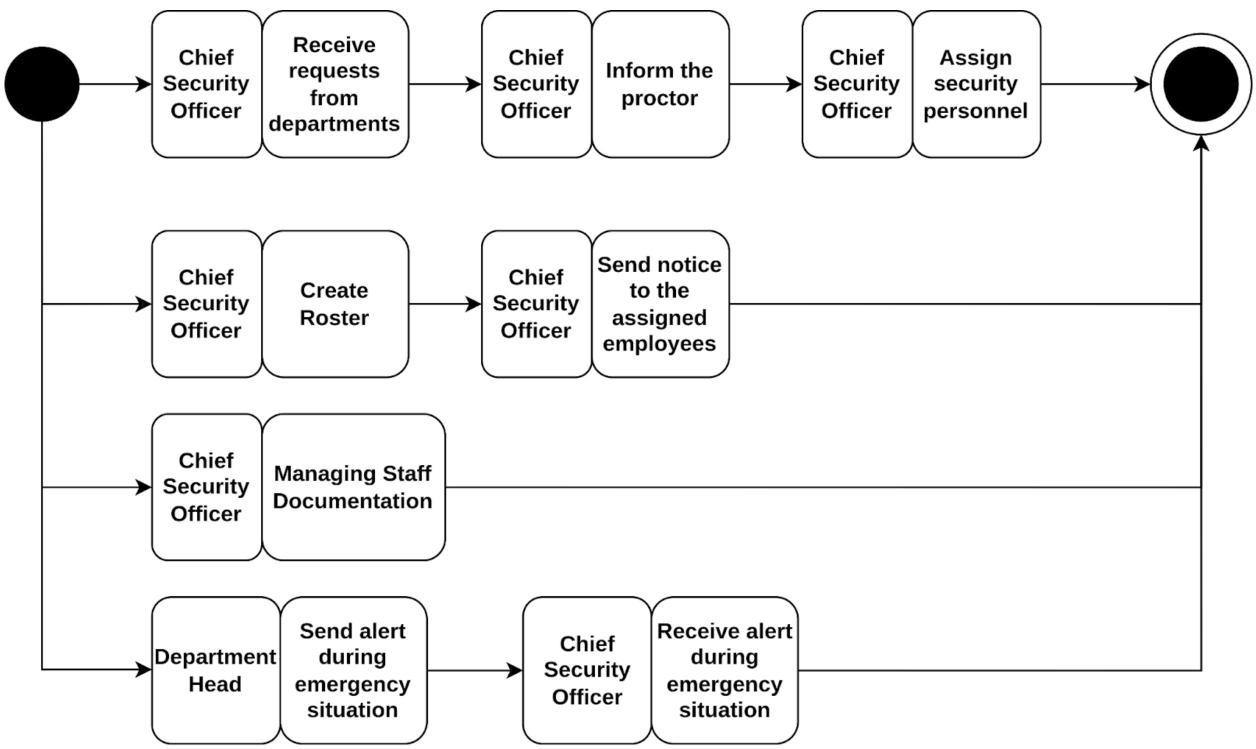
The register office issues instructions to the proctor of the University, who subsequently forwards them to the security office.When a department requires security personnel such as guards or police officers, they send a letter to the chief security officer. The chief security officer then orally informs the proctor. Following approval from the proctor, the security department dispatches security personnel to that department on the day specified in the letter.

However, It also creates a roster for 70 positions that details the employees assigned to each position.It also manages security staff' documentation, such as the number of days taken for leave and medical leave. The security office wants all departments to be able to notify the security office in the event of an unexpected emergency.At the time of any emergency situation in a department, it will be able to send an alert to the security office. The following process flow can be proposed for the security office section:

Steps	Actor	Description
Receive request from departments	Chief Security Officer	Receives the applications for the requirements of security people.
Inform the proctor	Chief Security Officer	Orally, informs the proctor about the requirements
Assign Security Personnel	Chief Security Officer	Dispatches security personnel to that department.
Create roster	Chief Security Officer	Creates a roster for 70 positions that details the employees assigned to each position
Send notice to the assigned employees	Chief Security Officer	Sends a duty notice to the assigned employees according to the roster
Manage staff documentation	Chief Security Officer	Manages security staff' documentation, such as the number of days taken for leave and medical leave.

Send alert during emergency situation	Department	At the time of any emergency situation in a department, it will be able to send a alert to the security office
Receive alert during emergency situation	Chief Security Officer	All departments must be able to notify the security office in the event of an unexpected emergency.

Action diagram for the process flow:



11. IT Infrastructure

Data Center, Web Services & Apps

Currently they are running a website that provides a limited number of services that includes student admission, faculty details, different office details etc. Besides websites, they also provide the institutional Mailing service for the student. In addition, they don't own their data centers, rather they use shared data centers and for special purposes like Admission, they use the services provided by BdREN.

Now, they intend to include more services that are crucial for smooth academic operations. The core services they want to introduce are:

1. e-Nothi (e-Filing System)
2. Digital Payment System
3. Teacher and Staff Management
4. Students Profiles

The sub-modules are one of the core parts of their web services. In the following sections, we have broken down the sub-modules in greater detail.

e-Filing System

This module is related to the transfer of files for approval through the internal and external personnel of University, often termed as the Approval Chain.

Creating and sharing documents within the university's e-Filing system involves a streamlined process accessible to students, staff, and faculties.

When a document is created, the user logs into the e-Filing system and uploads the document, categorizing it based on departments or types. Key information such as *title, description, author details, and relevant dates* are added.

After attaching the document file, the user reviews the entered details and selects the recipients, whether they are internal (university members) or external parties. Notification preferences are configured for email alerts.

Upon submission, recipients are notified via email about the document. They access the e-Filing system using a link in the email, view the document, and leave comments or annotations if needed.

Recipients can approve the document or respond accordingly. Multiple approval levels can be accommodated using an automated workflow. The e-Filing system maintains a comprehensive log of document actions for auditing purposes.

Status updates are sent back to the sender, keeping them informed about the document's progress. Once processed, the document is archived within the system.

For future reference, users can easily retrieve documents using the system's search and retrieval functions.

Here the users are the staff and the faculty members. This e-Filing system will be primarily used for internal & external communication.

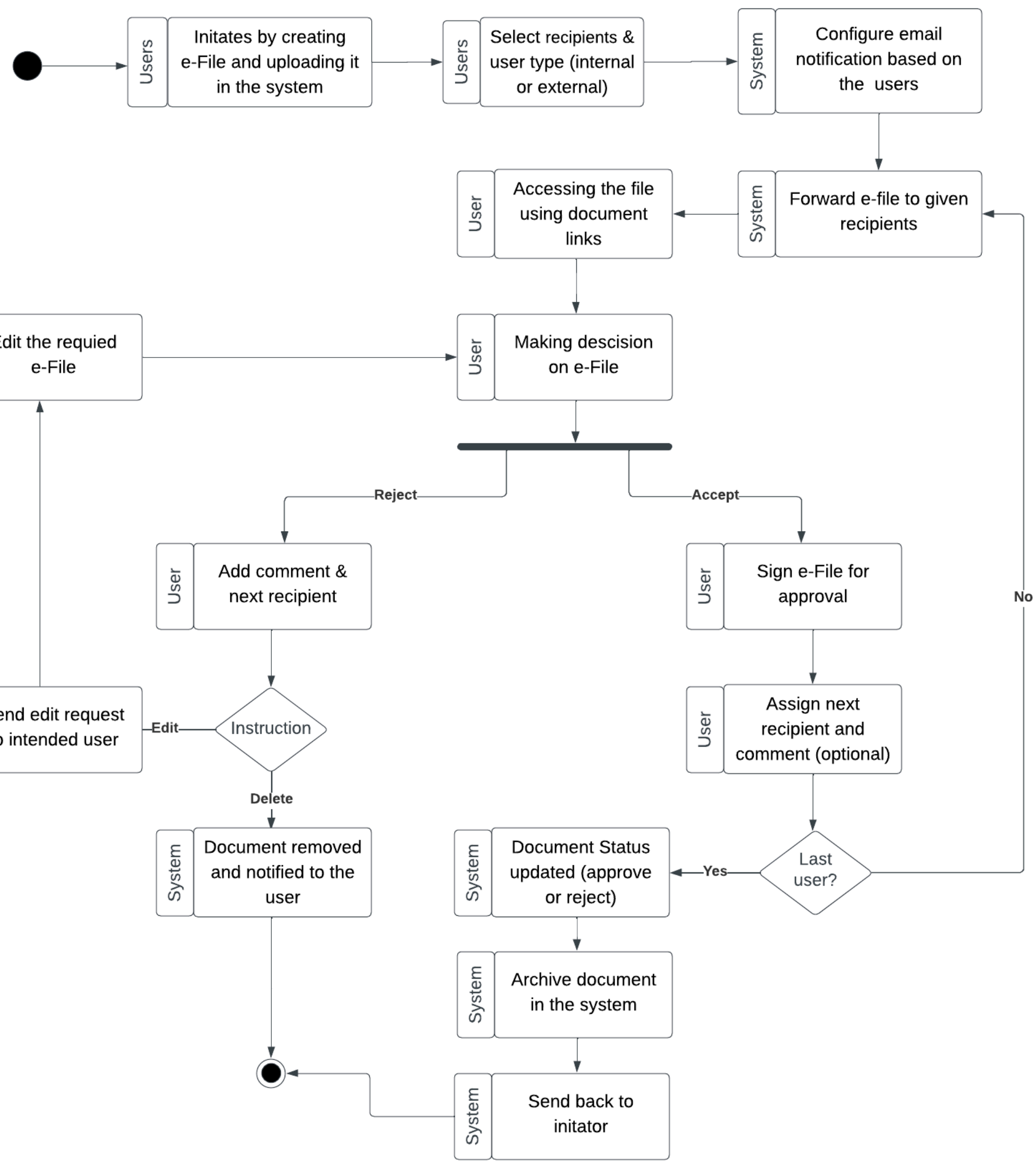


Fig: Activity Diagram (e-Filing System)

Digital Payment System

This module discusses the digital payment management system. CU wishes to digitize all its online transactions to:

- Easily confirm applications
- Streamline processes
- Better track transactions
- Record transactions
- Create receipts for the accounts division

Fees can be transacted using any of the following mediums:

- Via mobile banking (bKash, Nagad, Rocket etc.)
- Via online banking
- Via online payment gateways
-

For any type of transaction, there are a few activities associated with it:

- ICT Cell configures fee amount for transactions according to the rules

- After a transaction is completed, a receipt is generated containing:
    - Concern: the task for which the transaction was conducted
    - Amount
    - Timestamp, and
    - Payer (Institute, Student or Public) : If institute is the payer, then institute code will be included in the receipt. If a student is the payer, then a unique student id (registration number) and roll number will be included in the receipt. In case of the general public, only the transaction ID will be included.

- Financial reports will be generated by the system according to the requirements of the authority (daily, weekly, monthly or concerning a customizable time period). For example, a daily report can be generated using all the receipts of a particular day. Similarly, weekly/monthly reports can be generated using all the receipts of a particular week/month.

- Users can filter and search transactions based on concerns and payers

Below we present the basic working flow of digital payment system using payment gateway.

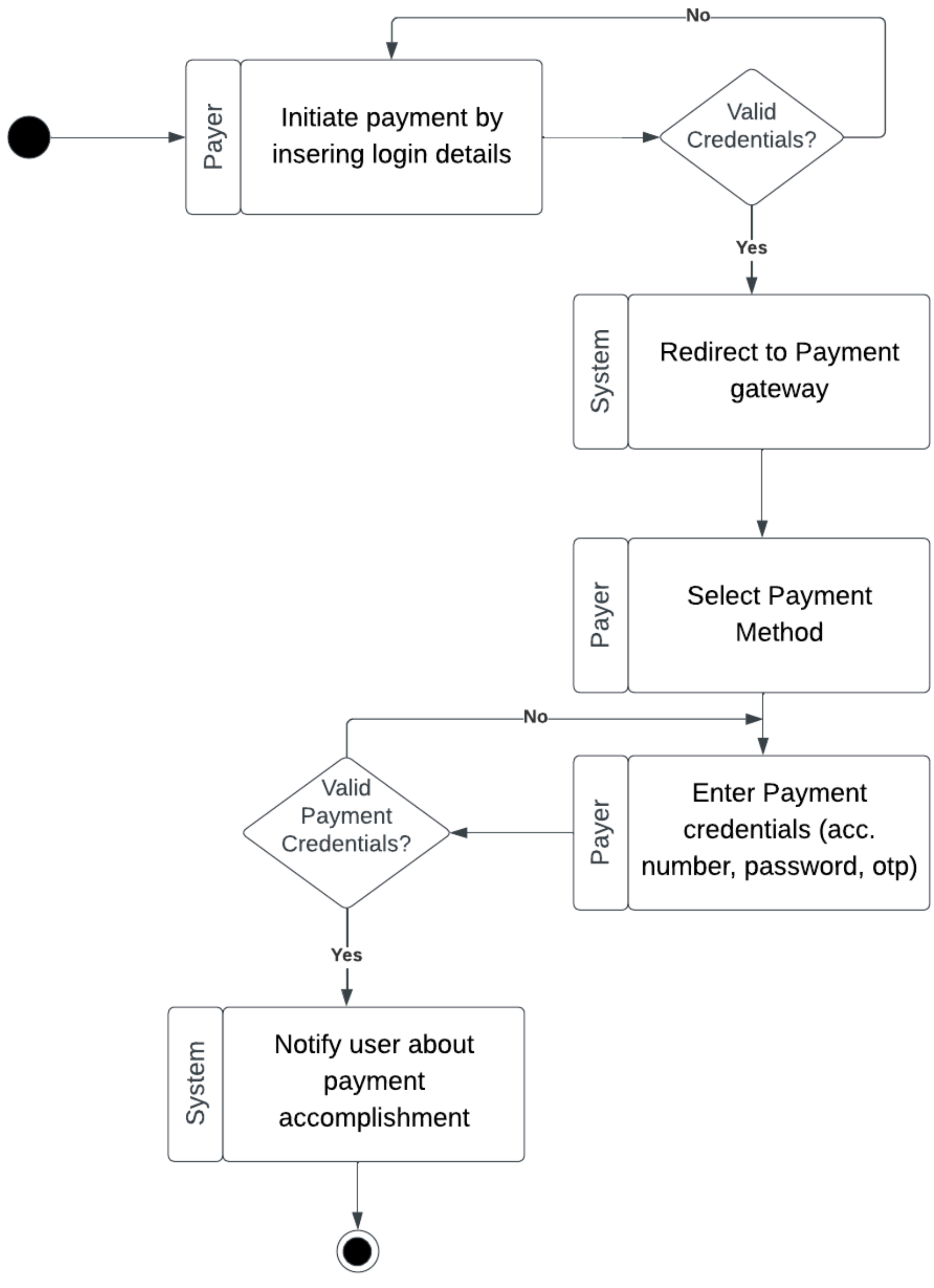


Fig: Activity Diagram (Digital Payment System through payment gateway)

And this is the general flow of payment management system.

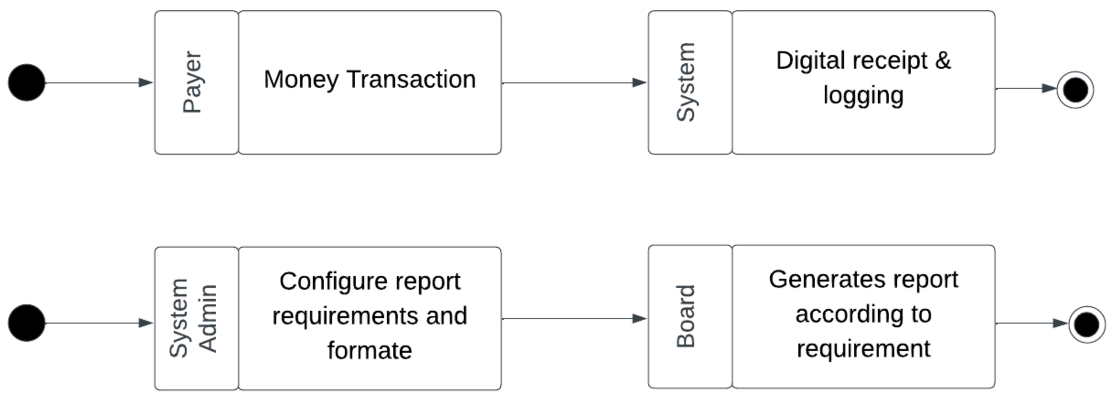


Fig: Activity Diagram (Digital Payment System)

Teacher and Staff Management

This module helps to manage teacher profiles in the database. It is responsible for the following tasks managed by the Institute head.

1. Add new teacher to their teacher list
2. Release them (Transfer Out)
3. Assign them (Transfer In)
4. Promote them
5. Terminate their tenure

Public can view the list of teachers. However, the internal activity of assigning, releasing and promoting individuals is confined within the authorized users of the institution.

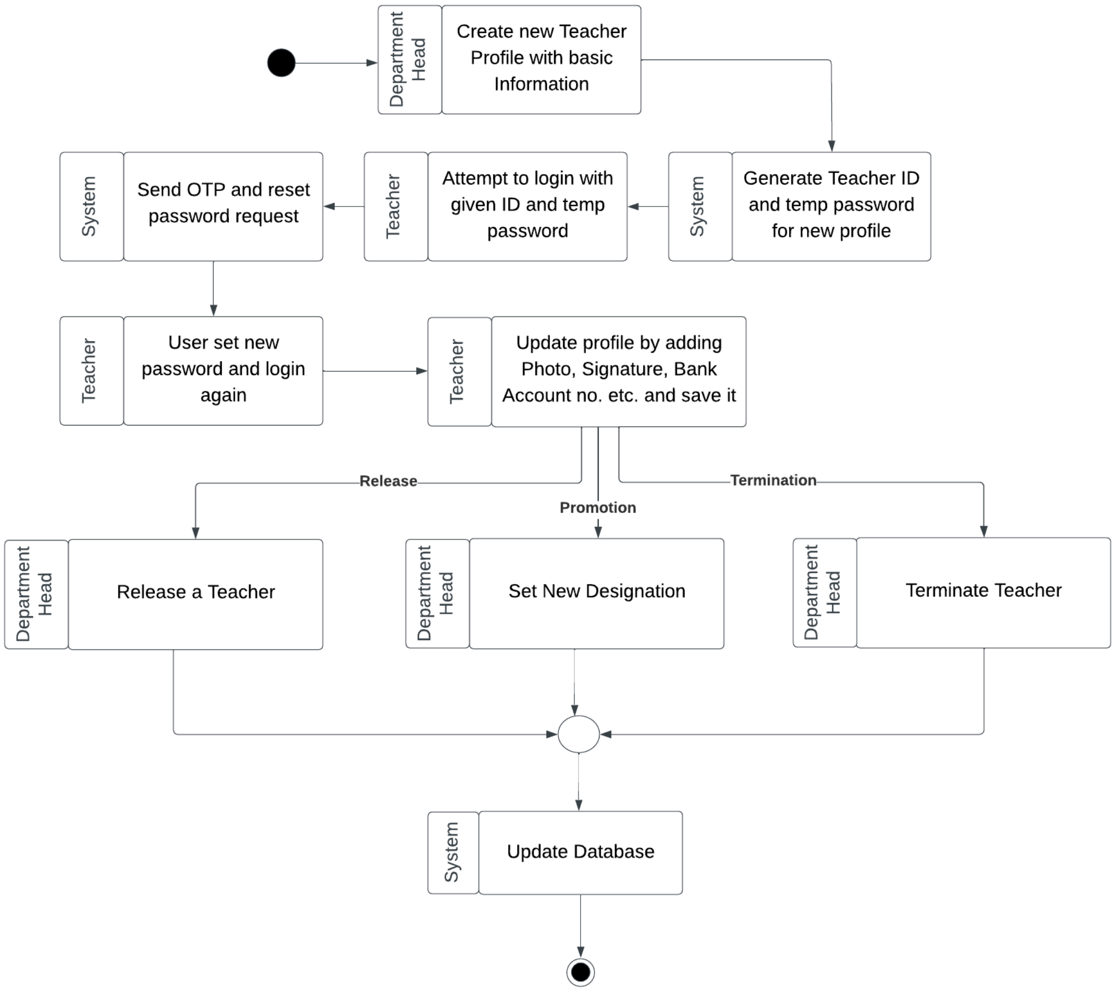


Fig: Activity Diagram (Teacher Management)

Staff management also follows the same procedure. However, who will be accountable for assigning new staff or will promote them is unsure.

Students Profiles

This section is covered in a previous chapter named ‘Department and Institution’

Campus Network

12. Miscellaneous

Inventory & Asset Management

The acquisition of all official properties falls under this module which is facilitated through the Central Store Section. All official equipment must be procured via this designated section.

In addition, there are mandatory procurement tasks associated with departments and individuals, such as obtaining stationery items for the university press or clothing for third and fourth-class staff members.

At the commencement of each fiscal year, departments and offices are allocated budgets. While offices have direct access to monetary funds for necessary expenditures, they are required to report their expenses to the Accounts section. Alternatively, the Central Store Section can procure necessary items on behalf of the offices. Departments submit their requirements for the fiscal year, which are then evaluated by a committee within the Central Store Section to determine their legitimacy. Upon approval, the requisition is forwarded to the Accounts department for financial clearance. The Accounts department verifies the department's budgetary capacity and approves the expenses if they fall within the allocated funds. Once approved, the Central Store Section proceeds with the purchase and stores the items until they are needed by the respective office.

If a department intends to buy a new item or replace an existing item, such as a computer or a photocopy machine, they must submit a formal request to the Central Store Section. The Central Store Section initiates the purchasing process, which involves obtaining budget clearance from the Accounts department. Once the clearance is granted by the Accounts department, the Accounts section proceeds to submit a formal requisition for the transfer of any existing item to the Central Store Section. Consequently, the Central Store Section takes possession of the old item (if any) while procuring the new item for the office. The Central Store Section arranges auctions once or twice a year to sell off these old items.

The following sub-sections can be proposed for the works of this section:

Note: Central Store Section will be written as CSS

Sub-section	**Duty**
Regulatory Works	Which works are routined and to be done every year in a fixed manner
Inventory Works	To buy, store and issue the properties for different

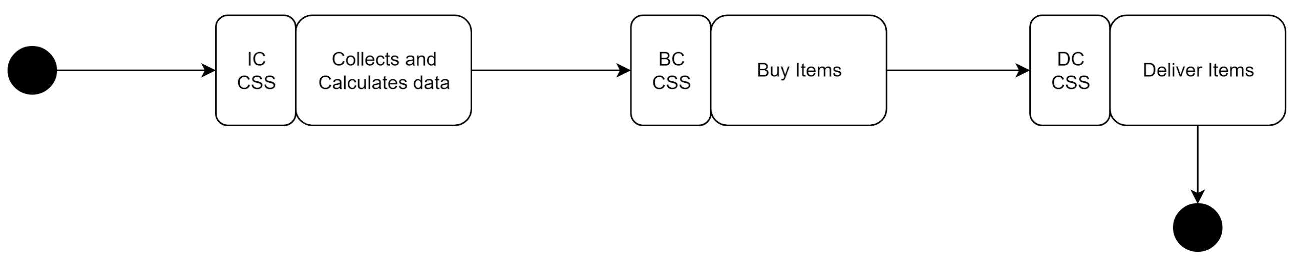
	departments and offices
On Requisition Works	To buy and issue the properties according to the need of different departments and offices
	To collect, store and auction-sale old/used properties

Regulatory Section

Here is the process flow for the regulatory works

Steps	Actor	Description
Data collection	Information Committee (CSS)	Collects and calculates data about what to buy, whom to buy for, and quantity
Buy Items	Buying Committee (CSS)	Buy the items according to the collected data.
Deliver Items	Delivery Committee (CSS)	Deliver the items to their receiver.

Action diagram for the process flow:

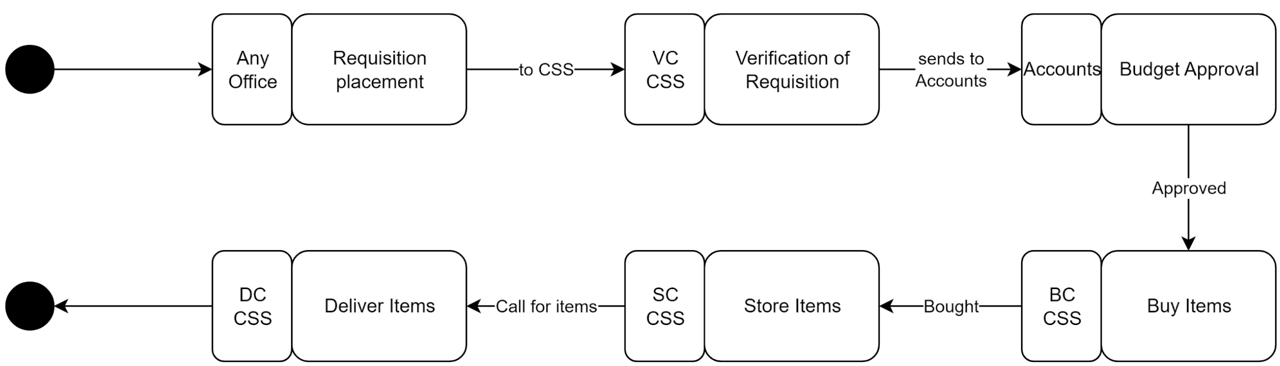


Inventory Section

Here is the process flow for the inventory works:

Steps	Actor	Description
Requisition Placement	Office/Department	Places a requisition about the things the office needs and the budget it will require
	Verification Committee (CSS)	Verify the requisitions placed by the offices (Whether they actually need those items or not)
Budget Approval	Accounts	Checks the budget whether the office/department is given the budget for the expenditure
Buy Items	Buying Committee (CSS)	Buy the items according to the requisition.
Store Items	Storing Committee (CSS)	Store the items until they are needed by the respective office.
Deliver Items	Delivery Committee (CSS)	Deliver the items whenever the office/department calls for them.

Action diagram for the process flow:

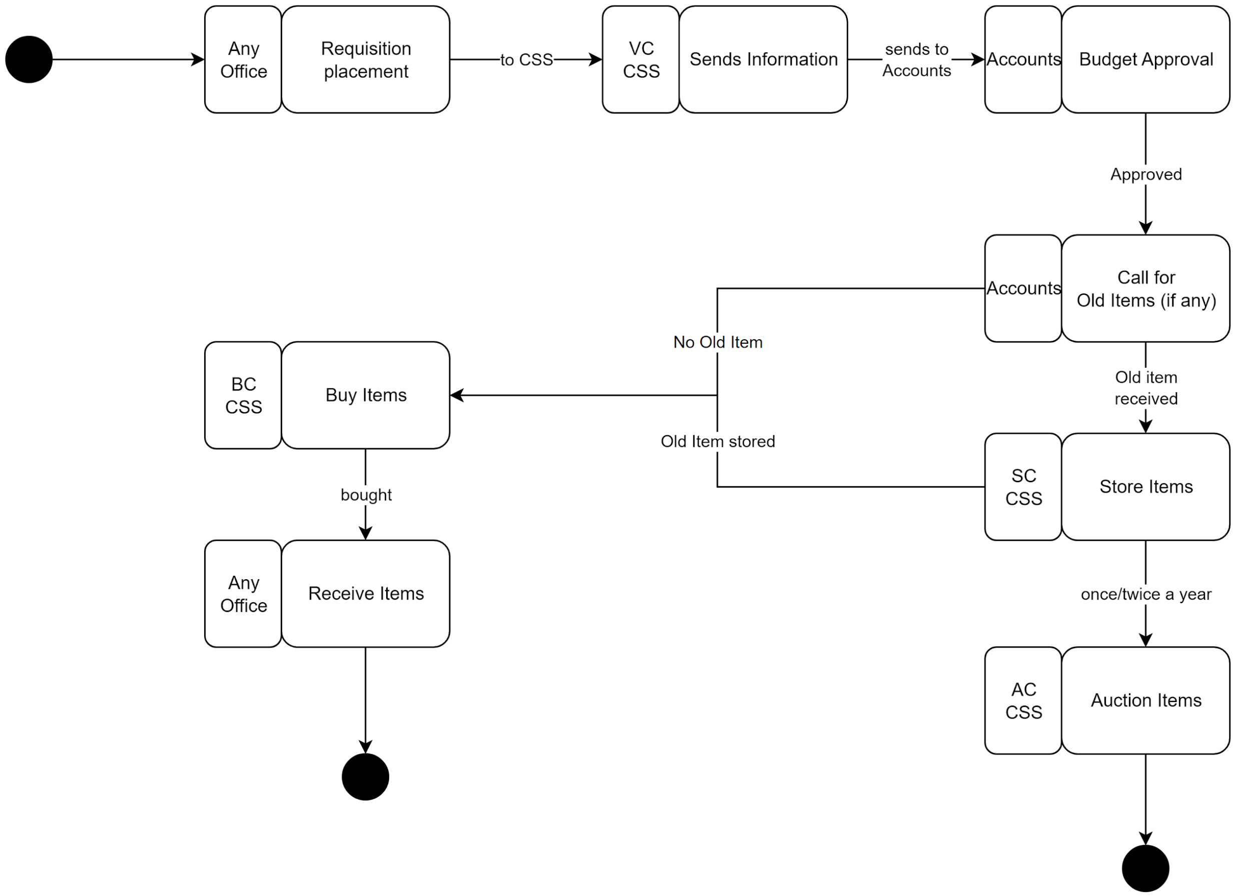


On Requisition Section

Here is the process flow for the on-requisition works

Steps	Actor	Description
Requisition Placement	Office/Department	Places a requisition to the CSS about the new item they need to buy or to replace an existing one
	Verification Committee (CSS)	Sends the monetary information about the requisition to the Accounts Section
Accounts' Approval	Accounts	Checks the accounts whether the requisition's monetary need falls under the issued budget for the office/department
	Accounts	If the budget is approved the Accounts puts a requisition to the office/department for handing over the existing old item (if any)
Store Items	Storing Committee (CSS)	If the office/department hands over the old item/s, CSS store those
Provide Items	Buying Committee (CSS)	Buy the items according to the requisition.
	Office/Department	Office/Department representative receives the item/s when the delivery is ready
Auction of Old items	Auction Committee (CSS)	Helds auction for once/twice a year to sell off the old items

Action diagram for the process flow:


Any Office
Requisition placement
to CSS
VC CSS
Sends Information
sends to Accounts
Accounts
Budget Approval
Approved
Accounts
Call for Old Items (if any)
No Old Item
Old item received
BC CSS
Buy Items
Old Item stored
SC CSS
Store Items
bought
Any Office
Receive Items
once/twice a year
AC CSS
Auction Items

13. Conclusion

Through the requirements analysis processes, a detailed specification for all the 11 broad modules of Chittagong University's ERP system has been documented in this SRS. Sections on Admission and Enrollment, Examination Processes, Result Processing and Course Management encapsulated the academic cycle of CU. Sections on Affiliated Section and their monitoring depicted the management of the institutes registered under CU. Other broad modules elaborate on the administrative functionalities of the registrar office and associated office, that are key for the automation of the mentioned processes. The ICT Cell section described their own distinct processes for ease of management and automation.

Desirable Expected Requirements of the CU ERP System

During the interview of the CU representatives, normal requirements were identified, which are illustrated in the previous chapters. Generally, normal requirements are the core business operations that are stated for the system during meetings with the stakeholders. Without fulfilling these requirements, the software will not be able to fulfill the objectives and users will not accept the product. However, there is another set of requirements called expected requirements, for example, some essential features of an ideal software should be flexible, efficient, reliable, easy to use and secure. These requirements are implicit to the system and may not be uttered by the users during the meeting. Whether those are explicitly mentioned or not, those features should be implemented. These sets of requirements are equally important as the normal requirements. The absence of these requirements will disrupt the service and sometimes will cease the operation.

The users should be able to see the system as a virtually centralized system. A user should not feel that they are remotely connected. This feeling should come from the experiences that they will be having. For example, a user exercising a service from Rangamati District should get the same performance as a user from Chittagong City. This is a difficult and challenging task. To ensure that following design issues must be considered.

- **Flexibility**

  The design of the system should ensure that if future requirements arise, the system should easily incorporate those changes. Ideally a minor change should not cause any architectural changes thus should not incur any cost. Changes can be of modifying an existing feature, temporarily or permanently suspending a feature or adding a new feature. In other words, we can say that the CU ERP system should be flexible for two reasons –

1. Ease of Modification
2. Ease of Enhancement.

- **Performance**

The design of the system should ensure that the performance of a single module and the system is acceptable. Performance of an individual module propagates to the whole system, thus a bottleneck problem may hamper the system. Some guiding principles for designing such system can be as follows:

1. Batch and Cache whenever possible
2. Minimize copying of data
3. Minimize network traffic
4. Take the advantages of parallelism even at the microprocessor level

From the CU authority's side, the performance of the system may be measured by the time to deliver the final output and at the same time, the cost of required infrastructure to get the output within that time.

- **Scalability**

Scalability is the capability to adapt increased or decreased load of users and services. It is acceptable that the user and service load of CU administration will not be consistent over the time. Most likely, it will grow over time. This should not cause disruption of service or serious degradation of system performance. The system should be able to adapt to varying user and service load. Ideally the system should be elastic in nature, at the very least in utilizing the hardware resources. Some guiding principles for such system can be as follows:

1. Use hierarchical or complete distributed entities whenever possible
2. Use distributed algorithms
3. Try to execute most of the operations at the client end whenever possible

- **Heterogeneity**

Users of the CU ERP system will use various kinds of devices to access the system. On the other hand, when new infrastructure is acquired they will not necessarily be of the same genre. The proposed CU ERP system should be able to handle diverse computing environments.

- **Reliability**

  The CU ERP system should be reliable in terms of data and service. The output of the system should always be the same and consistent over the time.

  1. A user wherever he or she may be located must always get the same result of the same query that he or she runs.
  2. A user wherever he or she may be located must always get the same performance of the same service that he or she seeks.

  To ensure that system redundancy may be required it must be designed in a cost-effective manner.

- **Ease of Use/User Experience**

  The proposed CU ERP system will be used by a varied group of people from different backgrounds and different levels of experience using web and mobile systems. The system should be accessible to all, prioritizing usability over appearance. Dashboards, as mentioned and described in many modules, should be easy to track and informative. Application forms should be intuitive - proper labelling and appropriate entry formats. Notifications should be clear, concise and noticeable without being intrusive.

- **Security**

  Security is a priority requirement for the concern system. We have mentioned details of the CU administrative processes as a core user requirement. However, the system should be designed keeping security in mind when fulfilling the user requirements. In other words, the system should be secured by design.

  Any abuse scenario derived from the identified user requirements needs to be addressed in the system design. In addition to system log, for specific sensitive operations, i.e. updating marks upon entry or updating any data in the result database, needs to be notified to other users selected by the CU authority. Hence, it is ensured that the system requires multiple user’s approval to update any sensitive data in the system. For accessing each service, proper authentication mechanisms should be in place. The authorization of a system's resources should follow the use of least privilege security principle.

  The security mechanisms that will be deployed during the system development, must be able to defend the current security vulnerabilities exist in the literature. In other words, the strength of the security mechanisms should be well proven. The security mechanisms used in the system should be open to all and hence, the system will not provide security through obscurity.

As a user requirement, the system may have interfaces with other systems. However, these interconnections should be managed in such a way that the weakness of the other connected system does not impose any security threats to the current system in the discussion.