Student Database Management

Edu-Vault

Project Charter:

SDMS is a centralized platform for managing and maintaining student information, such as personal background, academic performance, and enrolment records. In this way, it will allow the student to course-register, view available classes, keep track of class prerequisites, and maintain his academic progress throughout his educational career. Apart from that, SDMS provides real-time tracking of grades and transcript creation, and attendance monitoring helps provide analytics on academic performance to identify areas for improvement. This system allows for fee and payment management, and students get notified about their billing and financial aid. Sharing documents and resources between students and instructors has been eased, and communication has been enhanced with email notifications and announcements. In addition to functions mentioned above, this project aims to add few unique features: AI tool to generate records, live chat option with counsellor.

Assumptions

- Access to Technology: The users will include students, faculty, and administrators who shall be provided with the relevant technology to interact with it-computers and internet among other aids.
- User Technical Skills: Users shall have basic computer literacy and hence use this system with minimal training.
- Data Accuracy: The information to be input into the system, which includes but will not be limited to the student's information, courses enrolled in, and grades obtained, is accurate at the time of input.

- Data Privacy and Security: The system shall implement all relevant regulations regarding data privacy.
- Resource Availability: Sufficient resources shall be available, both human and technical, to design, develop, test, and implement the system.
- System Maintenance: This will provide post-launch ongoing support and maintenance toward ensuring up time of the system and fixing issues that arise.

In-Scope Features

- Centralized management: Maintain current student records comprising enrollment status, academic history, and personal information. Permit students to update their personal data in a secure manner.
- Academic Portal: Offer course enrollment while keeping track of all finished and ongoing courses. Maintaining grades and graduation requirements of each student.
- Financial aid tracking: Display payments and balances. Option to apply for scholarships.
- AI-Based Analytics: Courses are suggested to students based on their background, courses completed, and career interests based on data driven insights. Use student data and their academic records to offer personalized support.

- Student Engagement: Monitor student participation to increase their engagement in extracurricular activities. Invite them to the events based on their interests/major.
- Live Chat: Offering a chat option with Counselor support. This can be academic/ financial/student-visa related based on the initial chosen option.

Out-of-Scope features

- Mobile applications (focus will be on the web-based platform).
- Multi-language support (initial version will be in English only).
- Job placement services or career counselling integrations.
- Alumni tracking or post-graduation services.
- Any third-party integrations beyond Outlook Calendar and payment systems.

Milestones	**Deliverables**
Requirement Gathering and Analysis	Meeting with stakeholders Create detailed requirement specification document.
System Design	Database schema, system architecture diagram Detailed design document

Database Setup	Set up database on a development server
Core Module Development	Develop modules for basic functionalities like student enrollment, course management, attendance tracking.
User Interface Development	Create web interfaces for administrators and teachers.
Testing	Unit testing for individual modules.
Deploy the student database system	Set up the system on a live server or local environment.
Review the project	Present the system to the stakeholders. Gather feedback and make any final adjustments

Project Writeup:

The Student Database Management System (SDMS) is a comprehensive platform created to centralize and expedite student data and services administration. This initiative aims to give students a smooth and effective means of interacting with the university's many academic, financial, and support services.

Students enrolling for the courses are the system's target users. The SDMS seeks to increase data accuracy, facilitate better decision-making for students and

university administration, and improve student experience by establishing a common repository for student data and functionality.

The SDMS was designed with the goal of developing an integrated, safe, and user-friendly system that meets the various needs of the student body. Built on efficiency, data integrity, and accessibility, the system guarantees that students can quickly navigate and obtain the necessary materials while the university keeps correct and current records.

The main elements of the system and how they interact are clearly shown in the BPMN (Business Process Model and Notation) diagram. The following primary functionalities are delineated in the diagram:

a. Student Authentication and Dashboard: The authentication module verifies students' credentials to access the system. After successfully logging in, they are shown a dashboard that acts as the main entry point to all of the portals and services.

b. Academic Portal: Students can see available courses, verify requirements, register for classes, and view their academic records, including transcripts and grades, using this portal.

c. Financial Portal: Students can manage their financial transactions, including applying for financial aid, paying their bills, and checking their account balances, using this portal.

d. Health Portal: Students can schedule medical visits, upload pertinent documents, and view and update their medical records through the Health Portal.

e. Immigration Portal: Students can upload immigration paperwork, check the status of their applications, and maintain their visa status from this location.

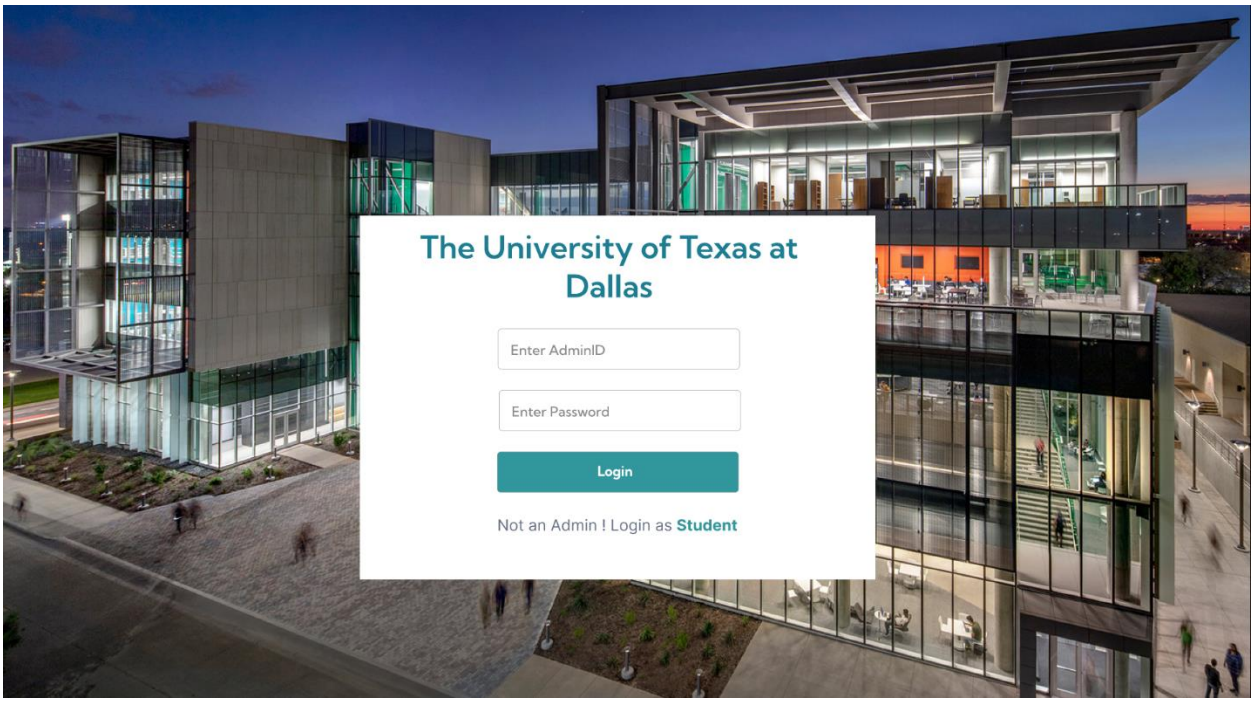
f. Counselling Portal: Students can choose and connect with counsellors, set up therapy sessions, and take advantage of chat-based support services through the Counseling Portal.

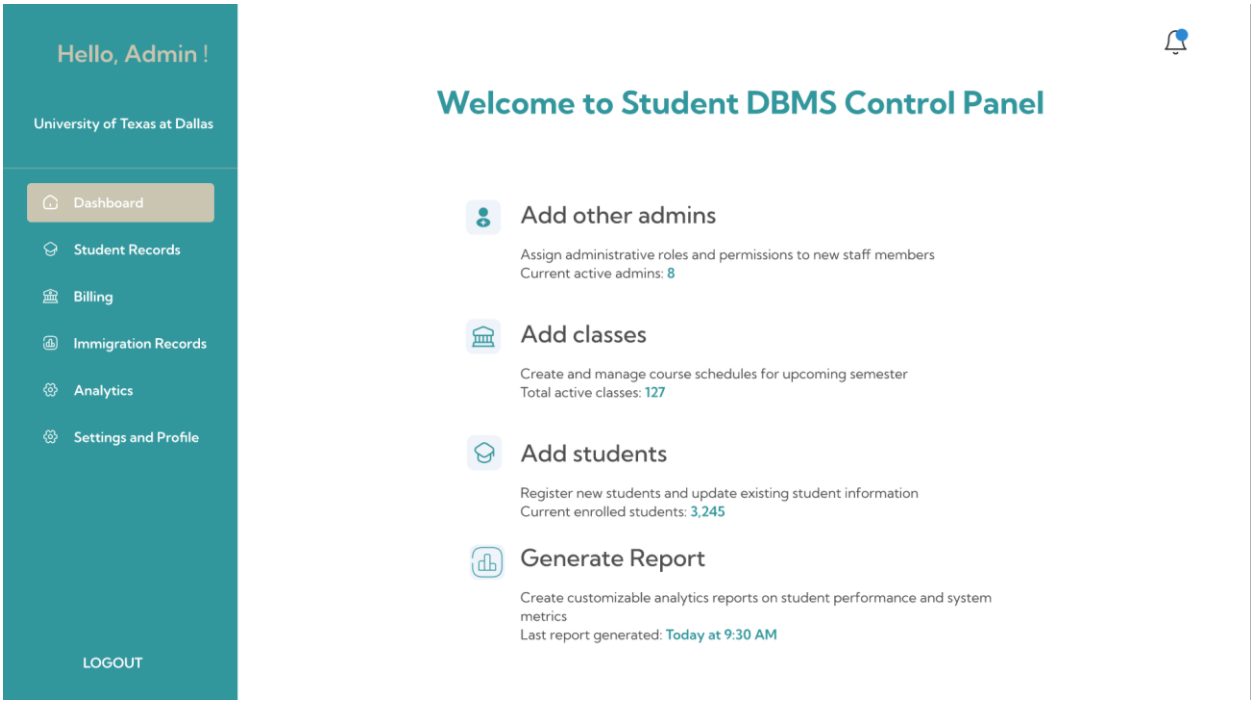
In addition to guaranteeing that the university has correct and current student records, the SDMS seeks to give students a smooth and effective way to access the resources they require by combining these numerous portals and services into a single, user-centric platform.

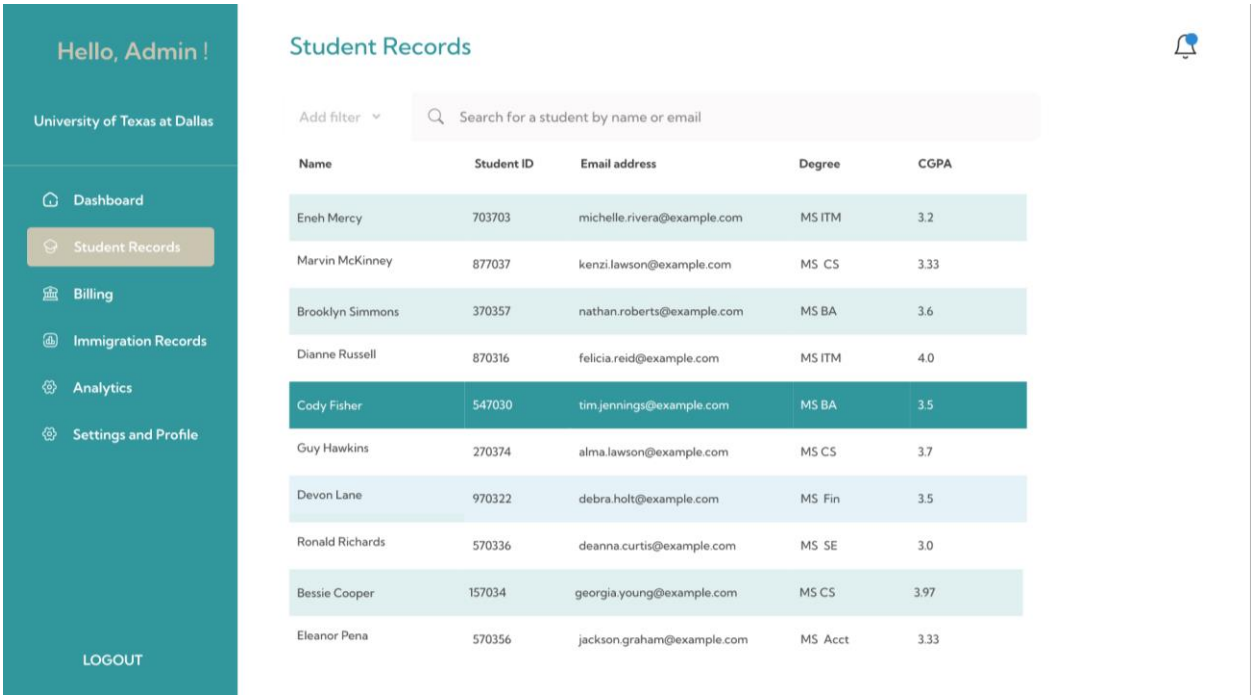
The SDMS project team has carefully planned the system to handle the issues and problems faced by the student body, ensuring that the product fulfils their changing requirements and goes above and beyond their expectations. The system is a sustainable and future-proof solution for the University of Texas at Dallas because of its scalable design and modular architecture, which permit future additions and improvements.

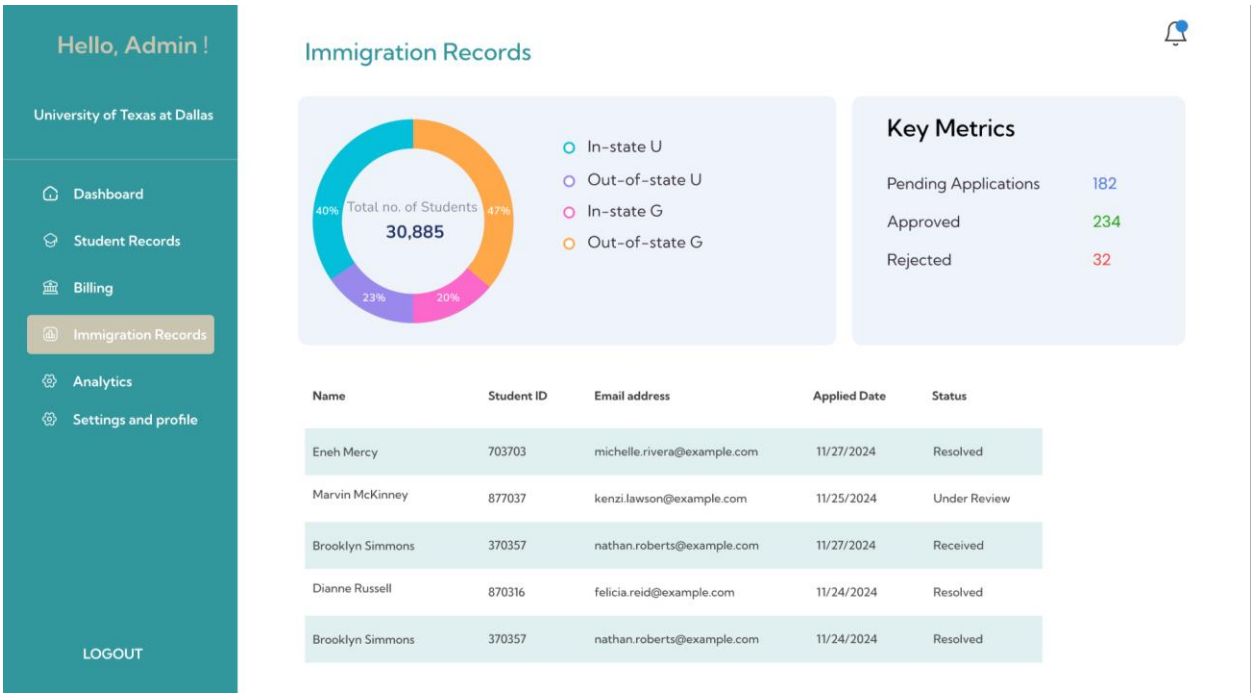
User Interface(FIGMA):

Admin View:

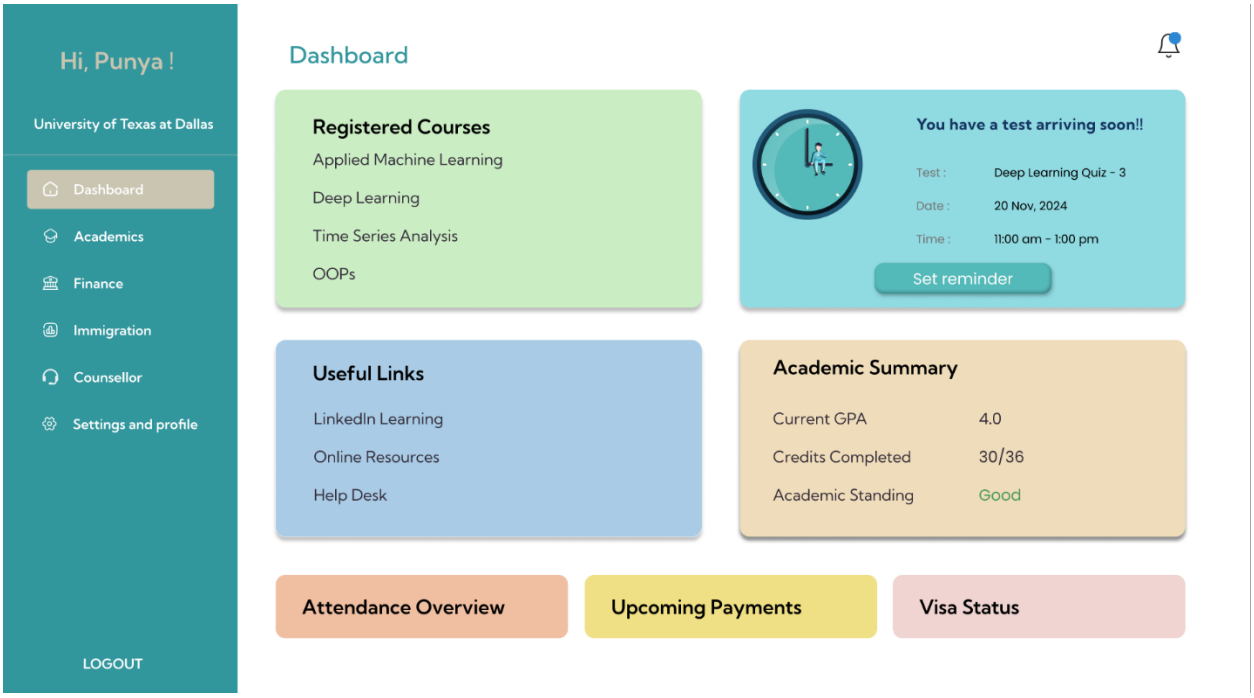


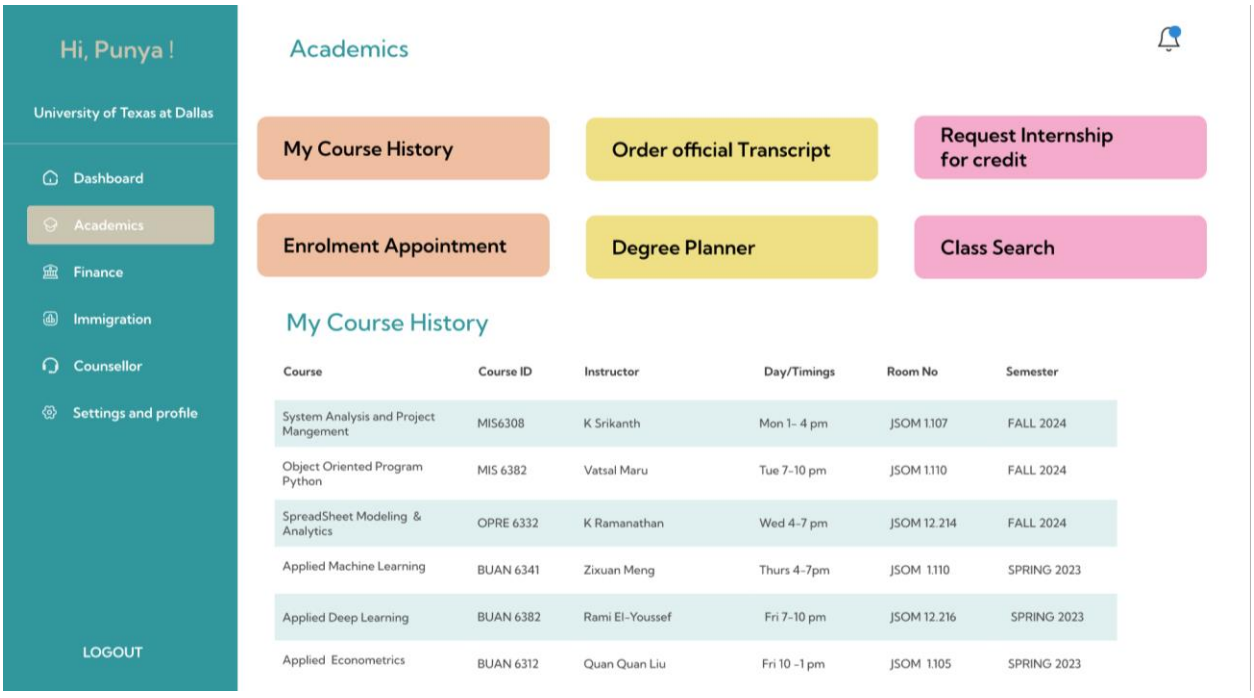


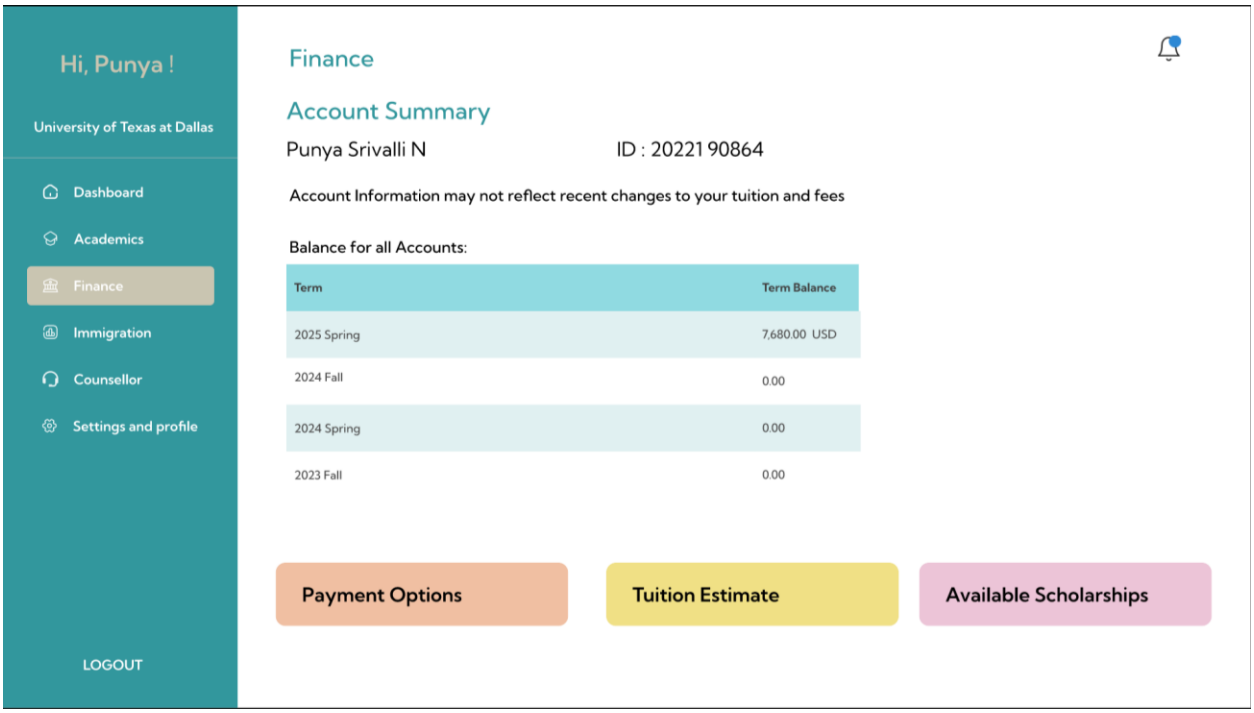

Hello, Admin !
University of Texas at Dallas
Dashboard
Student Records
Billing
Immigration Records
Analytics
Settings and Profile
LOGOUT
Student Records
Add filter
Search for a student by name or email
Name
Student ID
Email address
Degree
CGPA
Eneh Mercy 703703 michelle.rivera@example.com MS ITM 3.2
Marvin McKinney 877037 kenzi.lawson@example.com MS CS 3.33
Brooklyn Simmons 370357 nathan.roberts@example.com MS BA 3.6
Dianne Russell 870316 felicia.reid@example.com MS ITM 4.0
Cody Fisher 547030 tim.jennings@example.com MS BA 3.5
Guy Hawkins 270374 alma.lawson@example.com MS CS 3.7
Devon Lane 970322 debra.holt@example.com MS Fin 3.5
Ronald Richards 570336 deanna.curtis@example.com MS SE 3.0
Bessie Cooper 157034 georgia.young@example.com MS CS 3.97
Eleanor Pena 570356 jackson.graham@example.com MS Acct 3.33

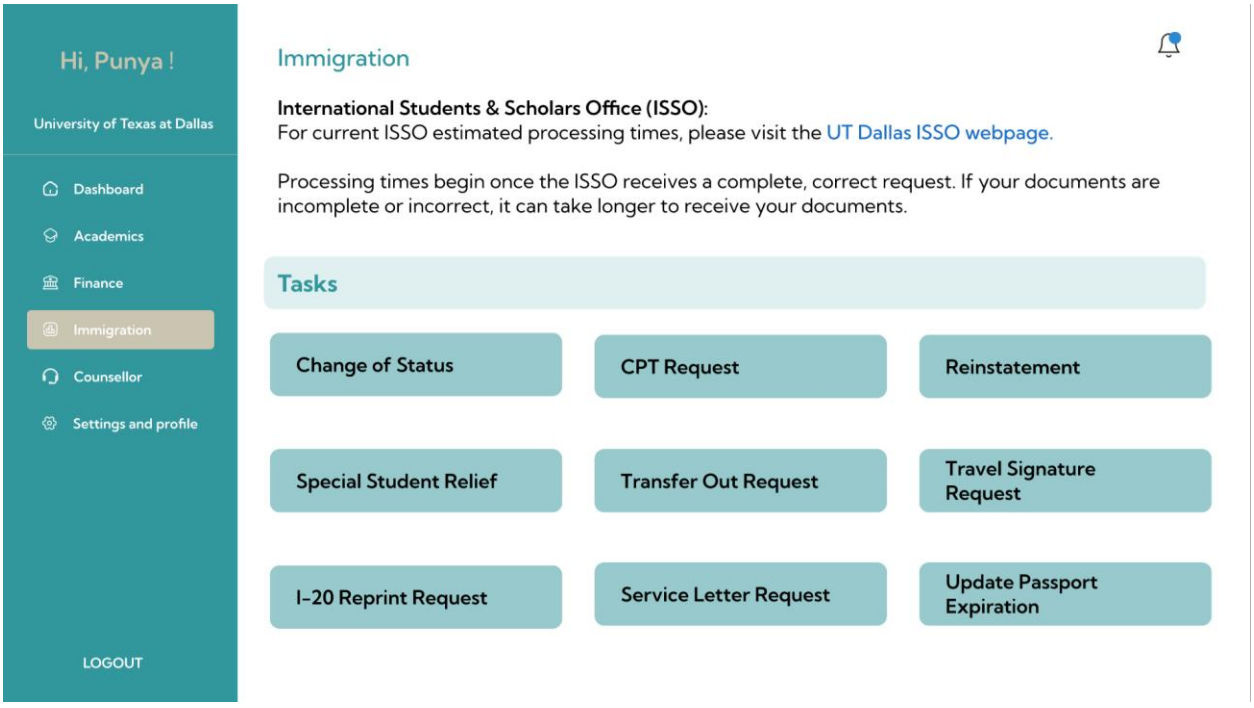

Hello, Admin !
University of Texas at Dallas
Dashboard
Student Records
Billing
Immigration Records
Analytics
Settings and profile
LOGOUT
Immigration Records
Total no. of Students
30,885
40%
47%
23%
20%
In-state U
Out-of-state U
In-state G
Out-of-state G
Key Metrics
Pending Applications 182
Approved 234
Rejected 32
Name
Student ID
Email address
Applied Date
Status
Eneh Mercy 703703 michelle.rivera@example.com 11/27/2024 Resolved
Marvin McKinney 877037 kenzi.lawson@example.com 11/25/2024 Under Review
Brooklyn Simmons 370357 nathan.roberts@example.com 11/27/2024 Received
Dianne Russell 870316 felicia.reid@example.com 11/24/2024 Resolved
Brooklyn Simmons 370357 nathan.roberts@example.com 11/24/2024 Resolved

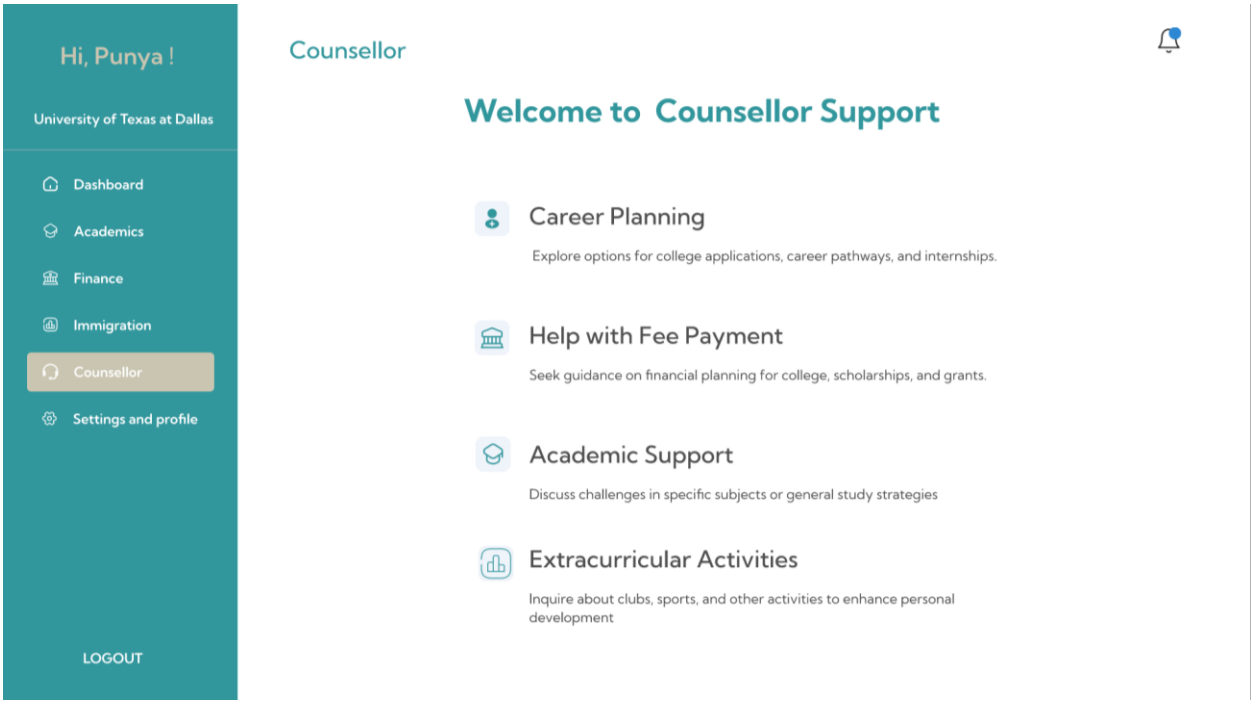
Student View:





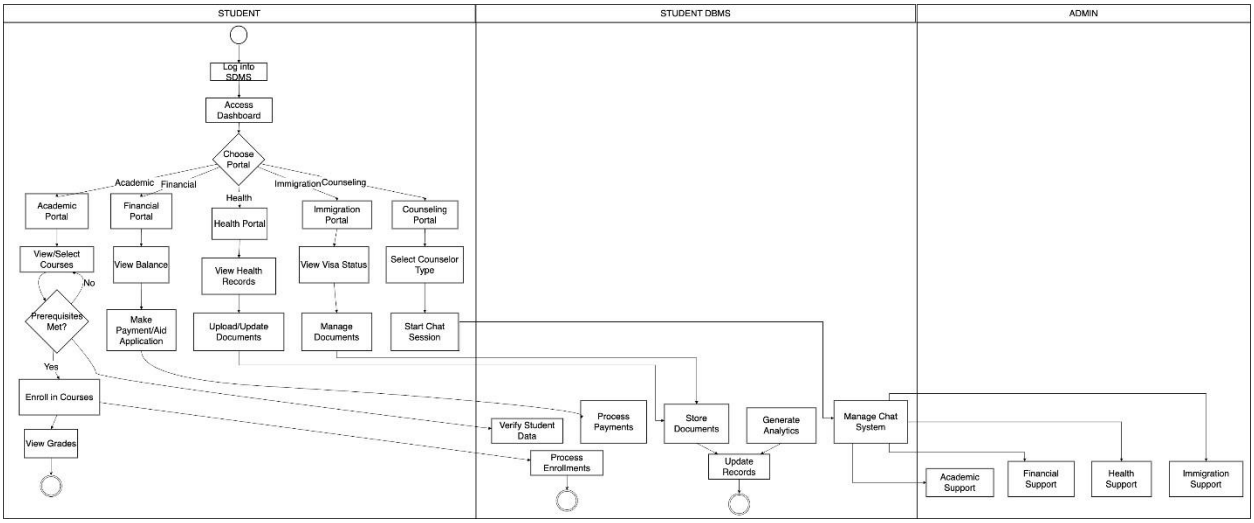

Hi, Punya !
University of Texas at Dallas
Dashboard
Academics
Finance
Immigration
Counsellor
Settings and profile
LOGOUT
Finance
Account Summary
Punya Srivalli N
ID : 20221 90864
Account Information may not reflect recent changes to your tuition and fees
Balance for all Accounts:
Term
Term Balance
2025 Spring
7,680.00 USD
2024 Fall
0.00
2024 Spring
0.00
2023 Fall
0.00
Payment Options
Tuition Estimate
Available Scholarships


Hi, Punya !
University of Texas at Dallas
Dashboard
Academics
Finance
Immigration
Counsellor
Settings and profile
LOGOUT
Immigration
International Students & Scholars Office (ISSO):
For current ISSO estimated processing times, please visit the UT Dallas ISSO webpage.
Processing times begin once the ISSO receives a complete, correct request. If your documents are incomplete or incorrect, it can take longer to receive your documents.
Tasks
Change of Status
CPT Request
Reinstatement
Special Student Relief
Transfer Out Request
Travel Signature Request
I-20 Reprint Request
Service Letter Request
Update Passport Expiration



STATIC MODELING

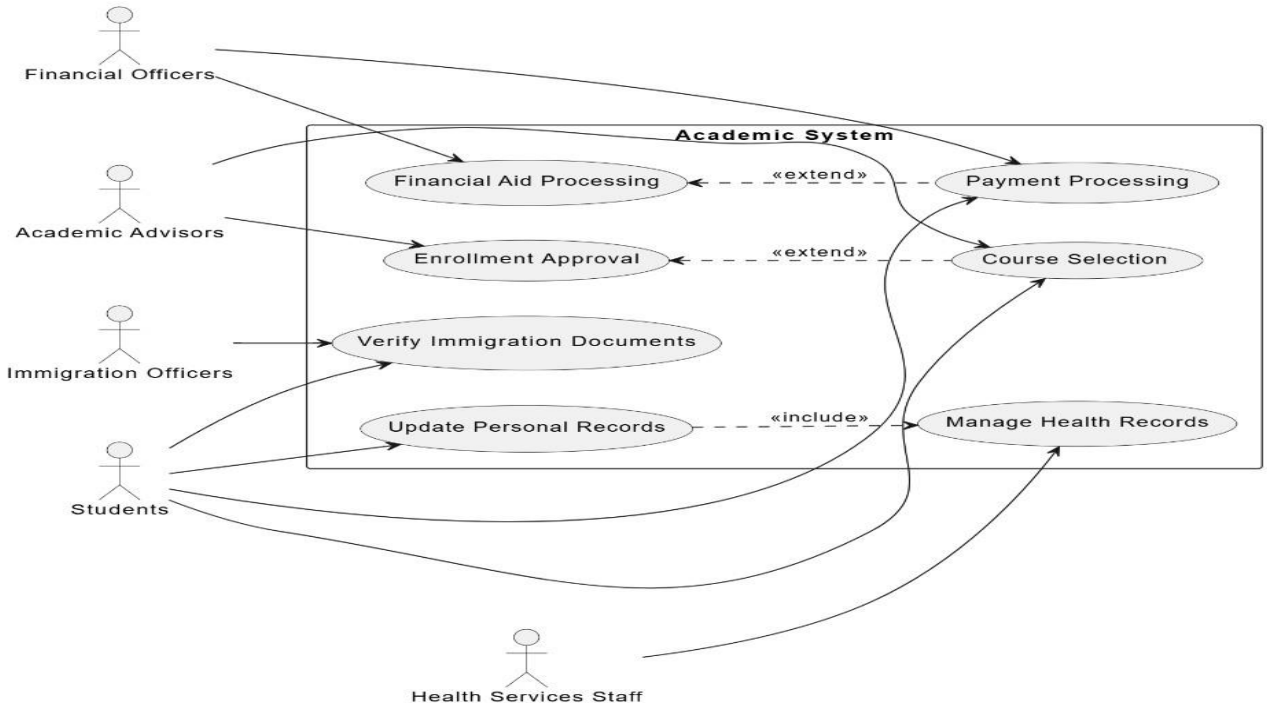
1.BPMN:



Explanation:

This diagram explains the workflow of the Student Database Management System, showing how a student, the SDMS, and an admin interact with each other. A student will log in to access the Academic, Financial, Health, Immigration, and Counseling portals for course enrollment, viewing balances, updating health records, managing visa documents, and seeking counseling support. Verification of data, processing of enrollments and payments, document storage, and analytics to maintain records are done by the Student DBMS; administration oversees the operation of academic, financial, health, and immigration support and ensures that operations are smooth and student services effective.

2.Use case:



Explanation:

The diagram illustrates a use case model for an Academic System, showing how various actors interact with its functions. Students are the central users, engaging with activities such as course selection, enrolment approval, updating personal records, and managing health records. Financial Officers oversee financial aid processing and payment processing, while Academic Advisors assist with enrolment approval. Immigration Officers are responsible for verifying immigration documents, and Health Services Staff manage students' health records. Key relationships include "include" links for managing health records as part of personal record updates and "extend" links connecting financial aid processing to payment processing and enrolment approval to course selection. The diagram effectively maps the system's interactions and dependencies.

2.1 Use case description

Actors and Their Roles:

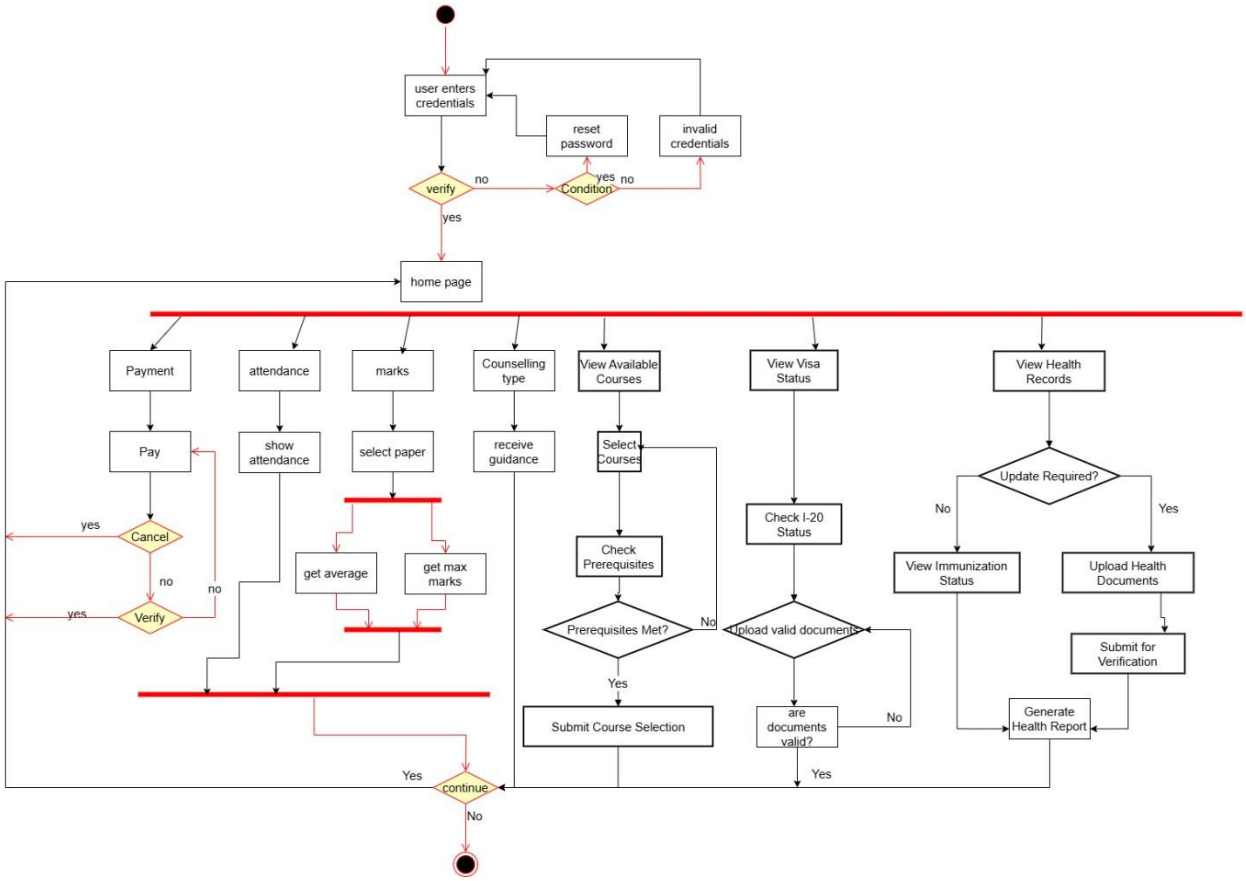
Financial Officers Responsible for managing and processing financial transactions and aids.
Academic Advisors Facilitate academic planning and approve student enrolments.
Immigration Officers Verify the validity and compliance of immigration documents.
Students Engage in activities such as course selection and personal record updates.
Health Services Staff Manage and maintain health records for students.

Use Cases:

Financial Aid Processing Primary Actor: Financial Officers Description: Process financial aids that may extend to handling subsequent payments. Relationship: Extend to Payment Processing
Payment Processing Primary Actor: Financial Officers Description: Handle transactions related to tuition fees and other payments.
Enrolment Approval Primary Actor: Academic Advisors Description: Approve student enrolments which can extend to influence course selections. Relationship: Extend to Course Selection
Course Selection Primary Actor: Students Description: Select courses as part of their academic curriculum.
Verify Immigration Documents Primary Actor: Immigration Officers Description: Check and ensure immigration documents are valid and compliant.
Update Personal Records Primary Actor: Students Description: Update personal details, mandatory inclusion of managing health records. Relationship: Include Manage Health Records
Manage Health Records Primary Actor: Health Services Staff

Description: Oversee and update health records as required.

3. Activity Diagram



Explanation:

This is the diagram for the student interaction workflow of a Student Management System. The process initiates with the login of a student through credentials, and it offers a host of options, including the following:

Payment: Maintains payment verification and processing.

Attendance: Students may access attendance records.

Marks: Students are allowed to paper selection, view average and maximum marks.

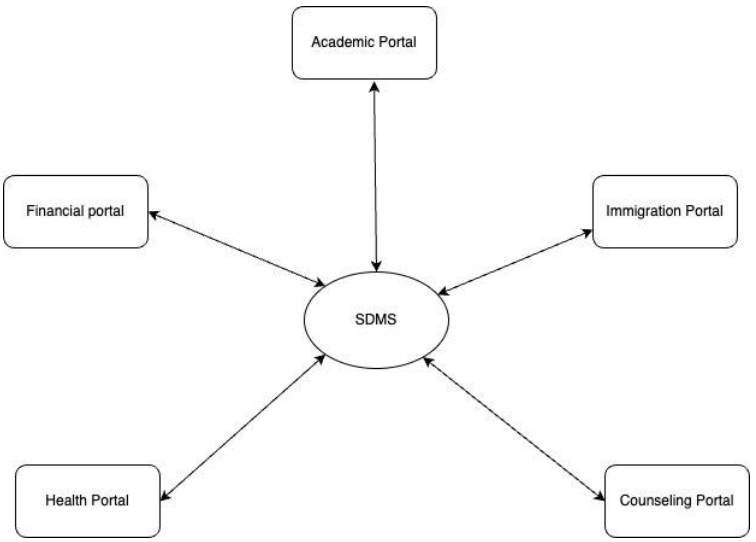
Counselling: Involves selection of counsellor and seeking guidance

Course Selection: Students check the course pre-requisite and submit their selected courses.

Immigration and Health: Has options to view visa status, upload documents for verification, and update/view health records.

The flow has several verification steps and conditional checks based on prerequisites or validity of the documents, leading to the outcome of the processing of every action of a student accurately.

4. Context Diagram (DFD level 0)



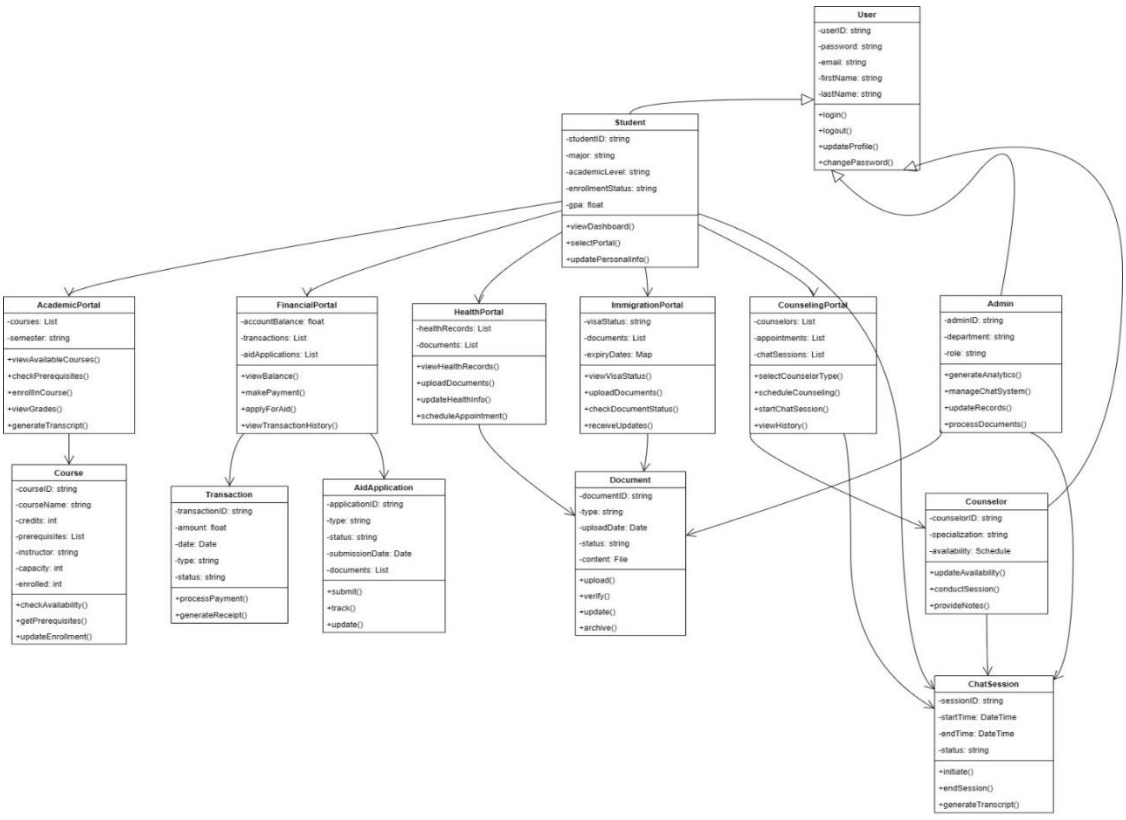
Explanation:

This diagram depicts a high-level system architecture for the Student Database Management System (SDMS). The SDMS serves as the central system connecting five key portals:

1. **Academic Portal:** For course selection, enrollment, and viewing grades.
2. **Financial Portal:** For managing payments, financial aid, and balances.
3. **Immigration Portal:** For tracking visa status and managing immigration-related documents.
4. **Health Portal:** For accessing health records and submitting health-related documents.
5. **Counseling Portal:** For seeking academic or career guidance and interacting with counselors.

Each portal is integrated with the SDMS, enabling seamless communication and data flow between the system and its respective functionalities.

5.Class Diagram:



Explanation:

This is a class diagram for the Student Database Management System (SDMS), showcasing the system's structure and relationships between various classes.

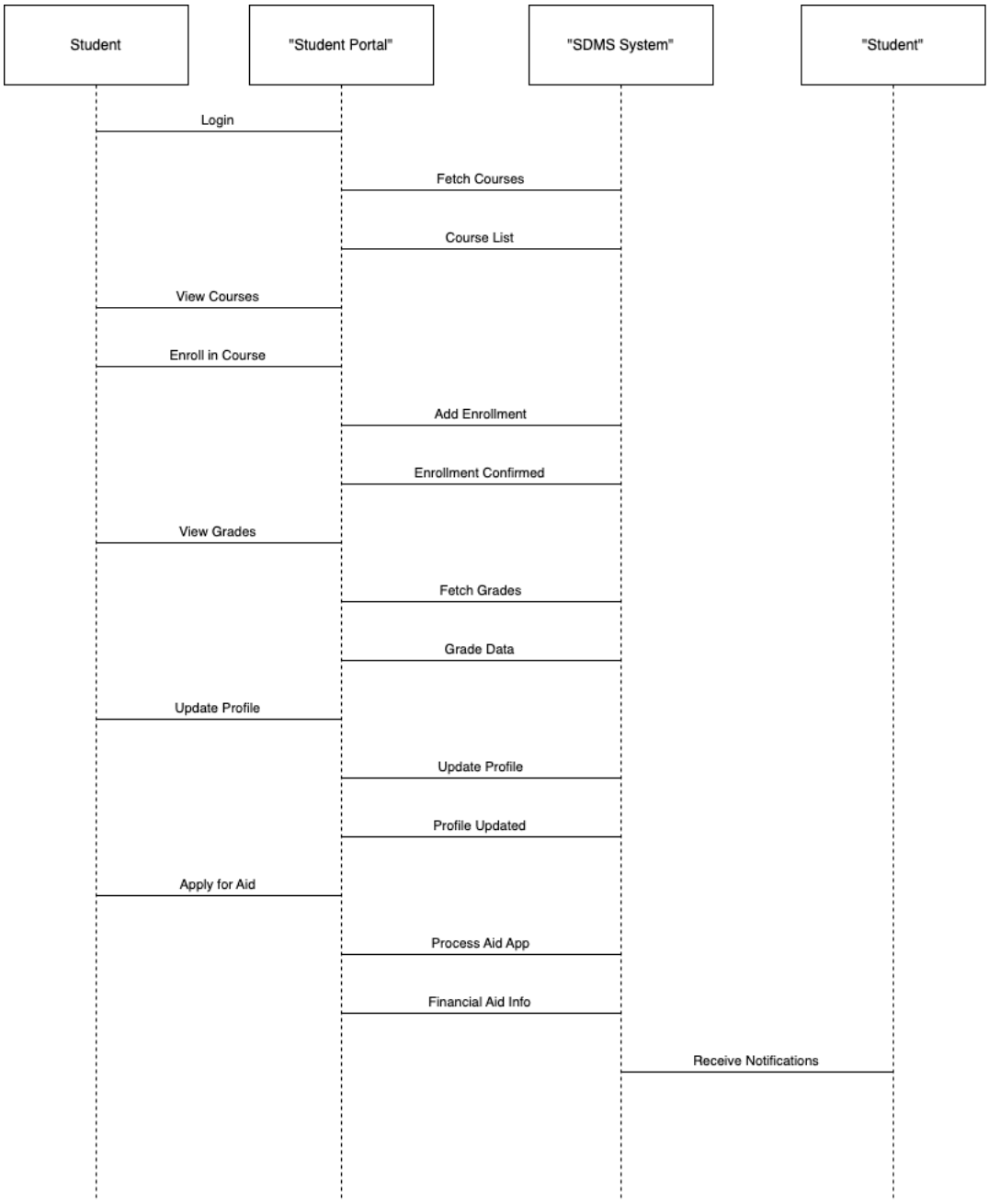
Key components include:

1. Core Class (Student): Acts as the central entity with attributes like studentID, name, email, and phone. It is connected to all key portal classes.
2. Portals:
    - AcademicPortal: Handles course management with attributes like courseList and methods such as viewCourses() and selectCourse().
    - FinancialPortal: Manages transactions and balances with methods like viewBalance() and makePayment().
    - HealthPortal: Maintains health records with methods such as uploadDocuments() and viewHealthRecords().
    - ImmigrationPortal: Tracks visa and document status using methods like checkVisaStatus() and submitDocuments().
    - CounselingPortal: Provides guidance services, with methods like scheduleSession() and viewCounselors().
3. Supporting Classes:
    - Course: Represents individual courses with attributes like courseID and name.
    - Transaction: Records payment details with attributes such as transactionID and amount.
    - Admin: Facilitates administrative tasks like approveRegistration() and generateReports().
4. Relationships:
    - Associations link the Student to each portal class, enabling interaction.
    - Admin is connected to multiple portals for managing data and approvals.

This diagram reflects a modular design, allowing for scalable and maintainable development of the SDMS.

Dynamic Modelling

a. Sequence Diagram



Explanation:

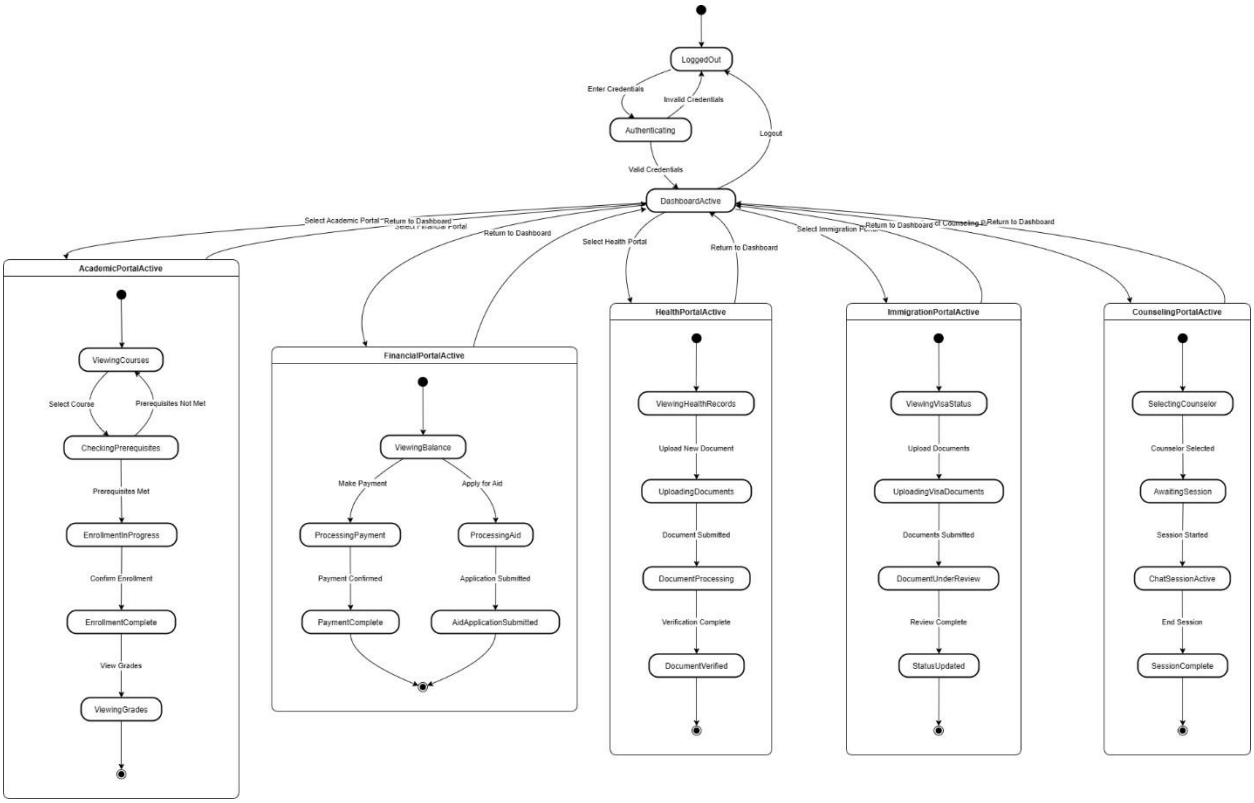
Description of the Student Database Management System (SDMS) Sequence Diagram: This diagram shows how the student, different system portals, and the SDMS's supporting database interact with one another. It describes the sequential sequence of tasks that a student can complete using the system.

Crucial Components:

- Authentication Flow: The student logs in to the system at the beginning of the diagram, and their credentials are checked before they are allowed access to the main dashboard.
- Portal Interactions: The student can choose and engage with several portals, such as the Academic, Financial, Health, Immigration, and Counselling portals, from the dashboard.
- Academic Portal Workflow: Students can see available courses, verify requirements, register for classes, and view their grades in the Academic Portal.
- Financial Portal Workflow: Students can check their account balance, seek financial help, and make payments using the Financial Portal.
- Portals for health, immigration, and counselling: these portals manage counselling sessions, upload and validate papers, and check the status of visas.

Significance: The Student Database Management System's user interactions and system operations are clearly and thoroughly summarized in the sequence diagram. It assists stakeholders in comprehending how activities proceed, spotting possible bottlenecks, and making sure the system accommodates the wide range of student needs.

b. State Chart



Explanation:

The various stages that a student's session may go through when interacting with the Student Database Management System (SDMS) are shown in the state chart figure. It offers a graphic depiction of how the system behaves and the different phases a learner may experience while using the platform.

Important States:

1. When a student is first logged out, they are not authenticated and cannot use the system.
2. In this step, the learner inputs their login information, which the system verifies before allowing access.
3. Dashboard Active: The student is able to access the many portals inside the SDMS once they have successfully authenticated.

States specific to the portal:

- Course Viewing, Prerequisite Checking, Enrolment in Progress, and Enrolment Complete are among the states available on the Academic Portal.
- Financial Portal: This includes processing aid applications, viewing balances, and processing payments.
- Health Portal: Provides the ability to upload documents and view medical records.
- Immigration Portal: Provides the ability to upload documents and view visa status.
- Counselling Portal: States include Chat Session Active, Awaiting Session, and Counsellor Selection.

Transitions and Validations:

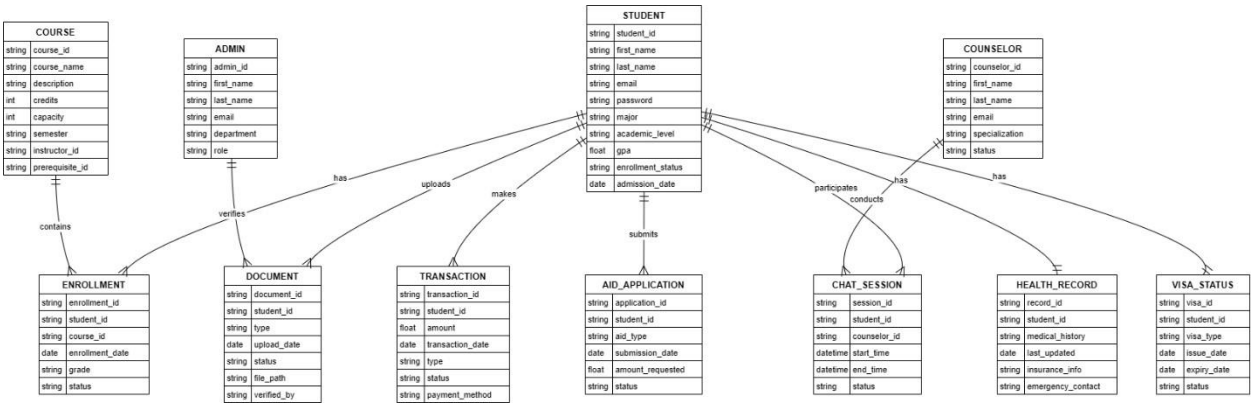
The state chart diagram shows the different state transitions as well as the system's validation tests. For instance, before completing the Academic Portal enrolment process, the student must fulfil the requirements for the course.

Significance:

A thorough grasp of the various phases a student may go through when utilizing the SDMS is offered by the state chart diagram. In addition to validating state transitions and ensuring the system maintains the proper user sessions and security measures throughout the student's interactions, it assists developers, system architects, and stakeholders in identifying the essential states.

Data Modelling

a.ER diagram



The entities, their characteristics, and their connections are shown in the SDMS's ER diagram. This data model's visual representation aids in ensuring that the system upholds data integrity and supports the different features that the university requires.

Important Parties:

a. Student: Keeps track of the student's academic records, personal information, and other pertinent information.
b. Course: Contains information about the available courses, such as prerequisites and enrolment restrictions.
c. Enrolment: Keeps track of a student's classes taken, grades, and enrolment status.
d. Transaction: Documents student financial transactions, including aid applications and payments.

e. Document: Keeps track of the different documents that students upload, along with their status and verification information.
f. Health Record: Keeps track of each student's insurance details and medical history.
g. Visa Status: Keeps track of overseas students' visa information and expiration dates.
h. Counsellor: Holds data about available counsellors and their areas of expertise.
i. Chat Session: Keeps track of student-counsellor counselling sessions.
j. Aid Application: Keeps track of students' financial aid applications.
k. Admin: Holds the information for the system administrators who oversee running it.

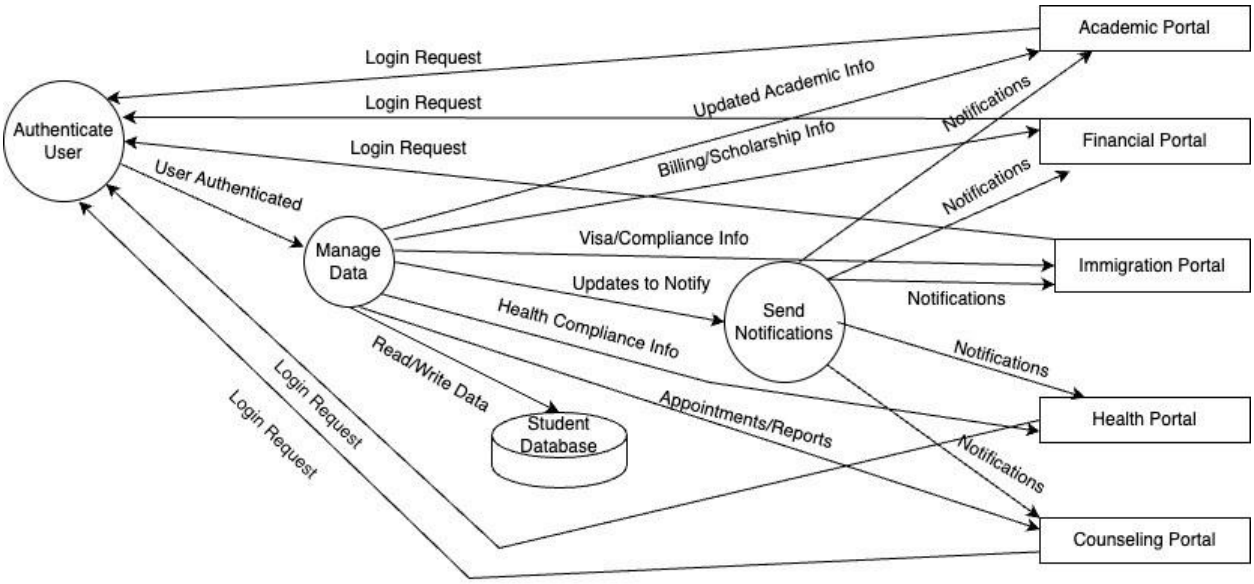
Cardinality and Relationships:

The ER diagram displays the cardinality and relationships among the entities. It is possible for a student to upload more than one paper, for instance, or for a course to have more than one enrolment.

Significance:

The SDMS database design is built upon the ER diagram, which guarantees that the data is organized to support the system's numerous features and workflows. It facilitates efficient data administration and reporting by assisting developers, database administrators, and stakeholders in comprehending the data entities, their characteristics, and their interrelationships.

b. DFD (level 1)



Explanation:

The diagram illustrates the functional flow of a Student Data Management System (SDMS), demonstrating how users interact with various components of the system and how data is managed and communicated between different portals. Below is an explanation of the key components and their interactions:

a. Authenticate User

- Purpose: Ensures that only authorized users can access the system.
- Flow:
    - Users (students, faculty, administrators) send login requests to the system.
    - The system verifies credentials and authenticates the user.
    - Once authenticated, the user can interact with the system and access relevant data or functionalities.

b. Manage Data

- Purpose: Central component responsible for data processing and management.
- Flow:
    - Retrieves and updates data from the Student Database.
    - Processes requests and interacts with different portals (e.g., Academic, Financial, Health) to provide or update information.
    - Manages compliance updates, billing records, academic data, health records, and more.

c. Student Database

- Purpose: Acts as the central repository for all student-related information.
- Flow:
    - Stores data such as academic records, financial information, health details, counselling sessions, and visa compliance.
    - Allows the Manage Data component to read and write data as needed.

d. Send Notifications

- Purpose: Facilitates communication by sending updates and notifications to different portals based on data changes.
- Flow:
    - Sends notifications to relevant portals when updates occur, as:
        - Academic Portal: Updates academic records or schedules.
        - Financial Portal: Notifies about billing or scholarship information.

- Immigration Portal: Provides visa or compliance updates.
- Health Portal: Sends health compliance information or appointment reminders.
- Counselling Portal: Notifies students about counselling sessions or reports.

e. Academic Portal

- Receives updated academic information from the system.
- Provides notifications related to class schedules, grades, and transcripts.

f. Financial Portal

- Receives billing and scholarship updates.
- Notifies users about payments, dues, or financial aid disbursements.

g. Immigration Portal

- Receives visa and compliance information.
- Sends alerts regarding visa expirations, renewals, or compliance requirements.

h. Health Portal

- Receives health compliance updates and reports.
- Notifies users about upcoming medical appointments or health requirements.

i. Counselling Portal

- Receives data about counselling sessions, appointments, or reports.
- Sends reminders or updates to students about mental health or career counselling sessions.

Resources:

1. Human Resources:

a. Project Manager, 2 Backend Developers, 2 Frontend Developers.

b. Database Administrator, 2 QA/Testers, AWS Cloud Architect.

c. Business Analyst, Technical Writer.

2. Software and Tools:

a. Development Tools: Python (Flask/Django), React.js/Angular, PostgreSQL/MySQL, GitHub.

b. Design Tools: Figma, draw.io.

c. Testing Tools: Selenium, JMeter.

3. AWS Services:

a. Compute: Amazon EC2, AWS Lambda.

b. Storage: Amazon RDS, Amazon S3.

c. Networking: Amazon VPC, Elastic Load Balancer.

d. Security: AWS IAM, AWS WAF, AWS Cognito, AWS Shield.

e. Monitoring: Amazon CloudWatch, AWS CloudTrail.

f. Machine Learning (Optional): Amazon SageMaker.

4. Infrastructure:

a. Development: Local IDEs, AWS Cloud9.

b. Staging and Production: Hosted on AWS.

5. Additional Needs:

a. Budget for AWS usage and licenses.

b. Training sessions for team members on AWS.

c. Support and maintenance post-deployment.

Project Plan

1. Project Overview:

- **Objective**: To develop a cloud-based SDMS using AWS to manage student information efficiently.
- **Duration**: 12 months (January 2025 - December 2025).
- **Team Size**: 6 members.
- **Scope**: Academic, Financial, Immigration, Health, and Counseling Portals.

2. Phases and Timeline

Phase	Activities	Timeline
Planning	Requirements gathering, scope definition, resource allocation, AWS architecture design.	Jan 2025 (2 weeks)
System Design	Create wireframes, database schema, AWS infrastructure design, and workflow diagrams (BPMN, ERD).	Feb 2025 (4 weeks)
Development - Backend	Build backend APIs, integrate AWS services (RDS, S3, Cognito, etc.).	Mar - May 2025
Development - Frontend	Design and implement user interfaces for each portal (React/Angular).	Apr - Jun 2025
Integration	Integrate backend and frontend; test AWS connectivity.	Jul 2025 (4 weeks)
Testing	Functional, performance, security testing; fix bugs.	Aug - Sep 2025
Deployment	Deploy on AWS (staging and production environments).	Oct 2025 (2 weeks)
Training and Documentation	Train stakeholders; finalize documentation.	Nov 2025 (2 weeks)
Launch and Maintenance	Official system launch and ongoing monitoring, support, and updates.	Dec 2025 onwards

3. Deliverables

- Functional SDMS with all five portals.
- AWS-hosted staging and production environments.
- Complete system documentation (technical and user manuals).
- Testing reports and analytics.

4. Tools and Resources

- **Development**: Python, React.js, PostgreSQL, AWS (EC2, RDS, S3, Cognito, etc.).
- **Collaboration**: Jira, Slack, Trello.
- **Testing**: Selenium, JMeter

5. Milestones

- **Feb 2025**: Finalize system design and workflows.
- **May 2025**: Complete backend development.
- **Jun 2025**: Complete frontend development.
- **Sep 2025**: Finish testing phase.
- **Oct 2025**: Deploy to AWS.
- **Dec 2025**: Launch SDMS.

6. Risks and Mitigation

- **Risk**: Delays in AWS setup.
  Mitigation: Allocate buffer time in integration phase.
- **Risk**: Security vulnerabilities.
  Mitigation: Conduct regular security testing and audits.