RISE-EDU

Software Design Specification

Phase 2

Revision History

Date	Revision	Description	Author
10/15/2025	1.0	Initial Version	Wail Mohammed
10/15/2025	1.1	Purpose, Scope, Definitions Updated	Wail Mohammed
10/15/2025	1.2	Updated class candidates 01,02,03,04,05	Wail Mohammed
10/17/2025	1.3	Updated class candidates 06,07,08,09,10	Wail, Yesenia, Emmanuel, Shichang
10/23/2025	1.4	Updated Class Diagram and Sequence diagrams	Wail Mohammed
10/25/2025	1.5	Updated all class candidates, added class 11	Wail, Yesenia, Emmanuel
10/26/2025	1.6	Updated the System Architecture	Emmanuel
10/27/2025	1.7	Updated Course Prerequisites Check	Shichang Wang
10/27/2025	1.8	Updated Project Description, Product Architecture.	Wail Mohammed
10/27/2025	1.9	Updated class candidates 1 to 11. Added description and new diagrams.	Wail Mohammed
10/28/2025	2.0	Added Client, Server, Client Handler and Message classes	Wail Mohammed
10/28/2025	2.1	Updated Product Design Definition to include facade design pattern	Wail Mohammed
10/28/2025	2.2	Updated Class 13 description and product design description	Wail Mohammed
10/28/2025	2.3	Updated Class Sequence Diagrams	Wail Mohammed
10/28/2025	2.4	Update Report diagram	Shichang Wang
10/28/2025	2.5	Update GUI Class	Shichang Wang
10/28/2025	2.6	Update Use Case Description	Shichang Wang, Wail Mohammed
12/1/2025	2.7	Updated new class diagram, class candidates to accommodate our slight design change to handle multiple universities, updated sequence diagrams and use case diagrams	Wail Mohammed

Table of Contents

1. Purpose

This document outlines the system design for the College Course Enrollment System Project. This expands on the software requirements specifications and outlines the system architecture, components, use case classes designs, communication models and the overall implementation of the system

1.1. Scope

This document will catalog the user, system, and hardware requirements for the CCES (College Course Enrollment) system. It will not, however, document how these requirements will be implemented. It will allow school administrators to create and manage the school's course schedule, while also providing students with tools to enroll, drop, and withdraw from courses. The system will also manage prerequisites for courses and allow users to waitlist if class sizes are full.

1.2. Definitions, Acronyms, Abbreviations

1.2.1 CCES: College Course Enrollment System

1.2.2 Student User: User that will be able to enroll, drop, waitlist and withdraw from classes.

1.2.3 Administrator: School admin user that will be responsible for managing course listings.

1.2.4 TCP/IP: A piece of software suite that will allow communication between client and server.

1.2.5 Client: Users interact with the client entity to be able to send and receive information from the server.

1.2.6 Server: The server is responsible for listening to and interacting with multiple clients at the same time, and managing information being received from the clients.

1.2.7 Add/Drop period is the same as registration period.

1.2.8 Withdrawal period is another period when student will be allowed to withdraw from a course.

1.3. References

Use Case Specification Document

UML Use Case Diagrams Document

Class Diagrams

Sequence Diagrams

1.4. Overview

The CCES (College Course Enrollment System) allows for the creation of college course schedules by administrators and allows students to enroll in these courses. The system will support class sizes, waiting lists, prerequisites, and reports. This system supports a network of universities, students, and Administrators. This is a Java application with a GUI that operates over TCP/IP. This system requires a server application and a client application. There is no web or HTML component.

2. Design Description

2.1. Product Perspective

The CCES system is a platform designed for university students and administrators. Administrators can control the number of courses, class size, waiting list size, prerequisites list, and issue reports. Students can enroll in courses, drop courses, and withdraw from courses. The logging module enables administrators to issue reports and for students to display their class schedules.

2.2. Product Architecture

2.2.1 The system uses a multithreaded client-server design pattern in which one server application can handle many client applications simultaneously while also handling multiple universities at the same time. This occurs from using a multi sub directory approach for every university. For example, University A will have its own directory with three sub folders namely, users.csv, course.csv and enrollment.csv. This way no admin or student from one university can access or alter the information of any other university.

2.2.2 The Server Application is responsible for listening to and interacting with clients while handling the business logic and data validation.

2.2.3 The Client Application is responsible for the Java-based GUI. This will allow system users (students and school administrators) to interact with the system. This client application will provide two different GUI views with different functionalities depending on whether the logged-in user is a Student or an Administrator.

2.2.4 All communication between the client and server occurs over TCP/IP.

2.2.5 The GUI system is designed using Java Swing and all data will be stored using a locally created file.

2.3 Product Features and Design Pattern

2.3.1 The system is divided into two primary components: the Client Application and the Server Application. The core business logic happens in the server, in which it processes all client requests. The main modules of the server business logic is consolidated into a single System Manger class which follows a facade design pattern to provide a simple and unified interface to all complex sub classes within the system.

2.3.2 System Manager: All requests from the client handler (server side) will use the System Manager to coordinate with other core sub classes to preform client requests. The system manager will manage data classes to create objects such as users, universities, courses, as well as processes the core enrollment , drop , and withdrawal requests by delegating the work to the other specialized sub classes. The responsibilities of the System Manager facade will include the following:

2.3.2.1 User Management: Once a user object is created and found, this will handle user authentication using a predefined users data file, by examining the password.

2.3.2.2 Course Management Once a course is created and found, this will handle updating, deleting, editing, and updating of all course information that include class size, waitlist size, and prerequisites.

2.3.2.3 Enrollment Management: To handle student course enrollment , course drop , course withdrawal , and checking for waitlist size. This will check for enrollment course limits and check prerequisites.

2.3.2.4 Report Management: To generate reports for system users. For example, administrators can use it to generate course enrollment reports while student users will use it to generate class schedules.

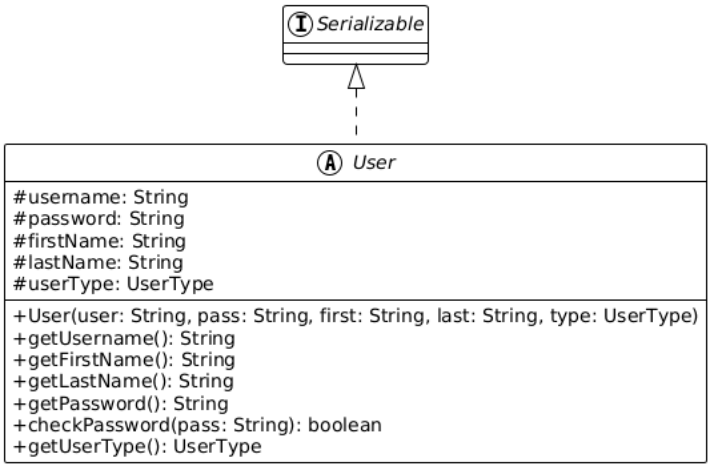
2.3.2.5 Data Management: To handle all system data. It will use a locally created database files to load and save data objects of users, courses, universities. As well as handle enrollment actions such as enroll, drop, waitlist, and withdraw.

2.3.3 The system's client and server will use a request/response model. In which the client will initiate a request to the server, the server will acknowledge the request, processes it, then sends the response back to the server. The information being sent will be encapsulated in a serializable Message class.

3. Class Design

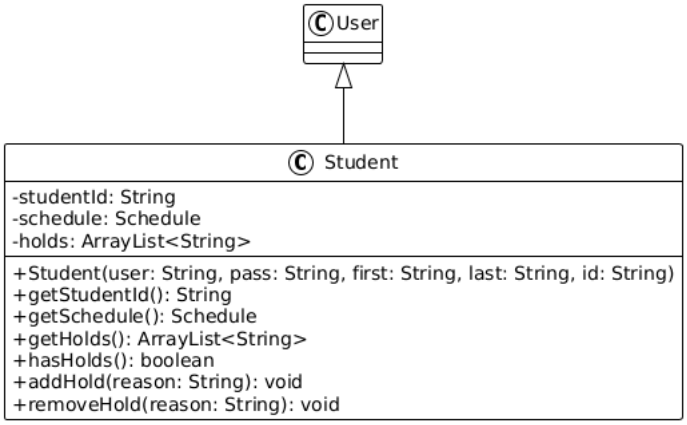
Class 1: User

Description : Abstract user class which prevents the creation of a new User object.



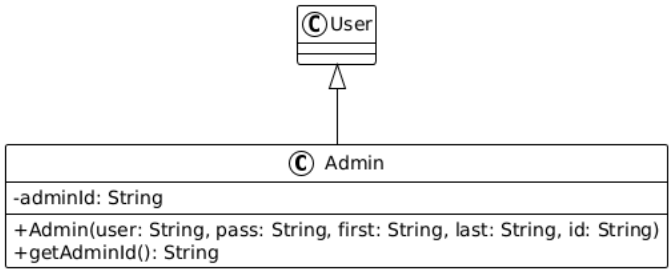
Class 2: Student

Description: This class represents a student user. It inherits all the properties of User (like username, password) and adds student-specific methods such as viewCourse, enrollInCourse, viewSchedule, etc..)



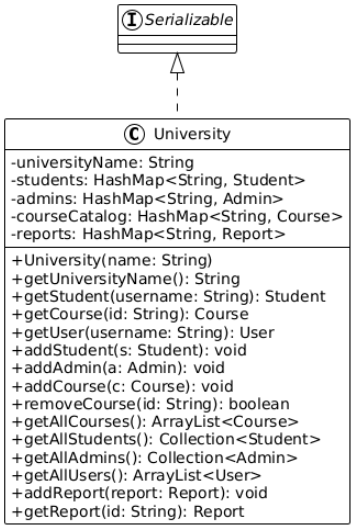
Class 3: Administrator

Description: This class represents an admin user. It inherits all the properties of User (like username, password) and adds admin-specific methods such as addStudent, createCourse, placeHoldOnAccount, generateEnrollmentReport, etc..)



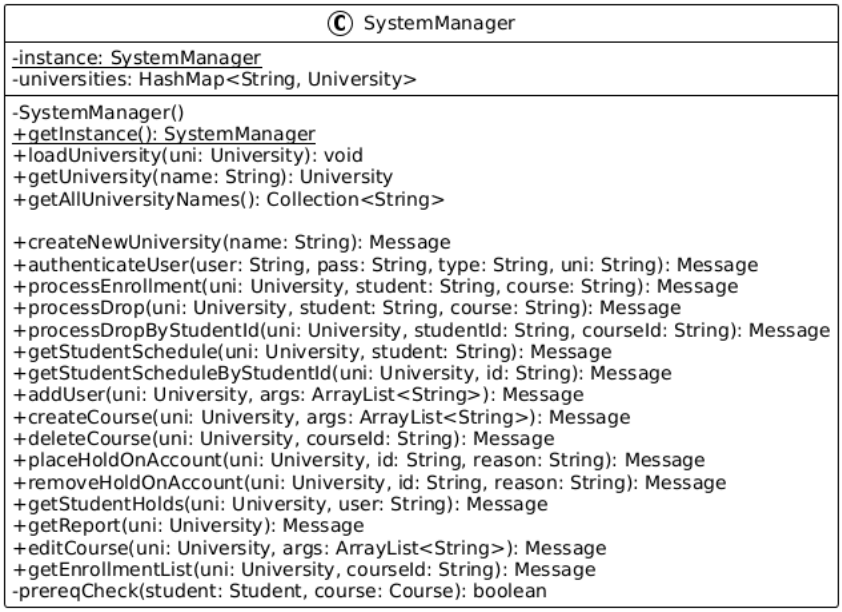
Class 4: University

Description: This class represents a university that contains all students, admins and courses per university. The system manager (next class) will first use this class to first get the correct university, then get all the students or courses dealing with that university.



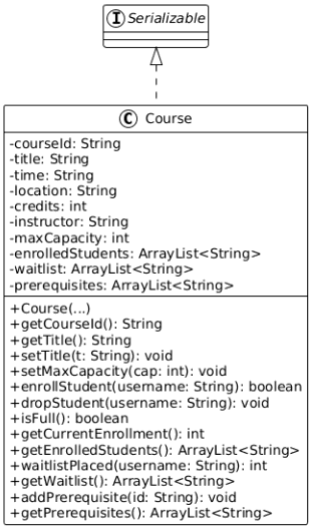
Class 5: System Manager

Description: This class represents the system manager, which handles the core business logic of the application. It acts as a facade for the system by hiding all complex interactions between University class, User class, Student, Course, Data Manager, etc... Therefore providing a single high-level interface which the ClientHandler will use to manage all requests and access system core functions.



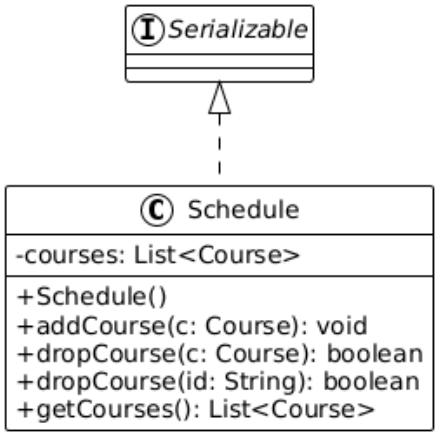
Class 6: Course

Description: This class holds the data for a single course such as course name, time, location, instructor, class size, units, etc. It also manages students being added or removed. It also holds prerequisites if needed.



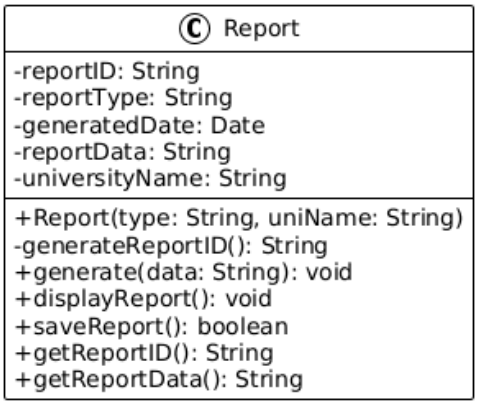
Class 7: Schedule (List of courses for students schedule)

Description: This class is to hold a list of Course object for a specific student in a specific semester. For instance, if the Student class calls student.viewSchedule() it will create and return a Schedule object.



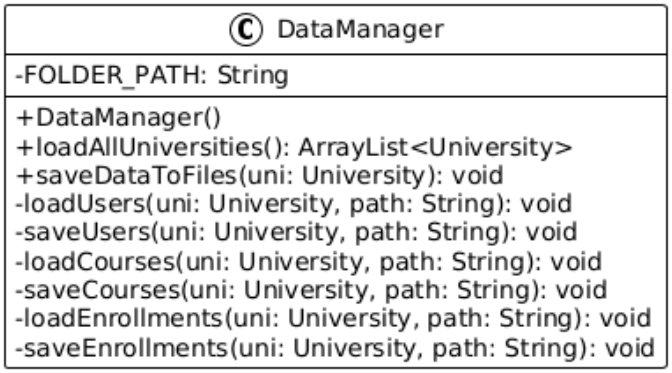
Class 8: Report:

Description: This is a data class that holds the logs which the Administrator class will create an object to pass in data and generate and save reports.



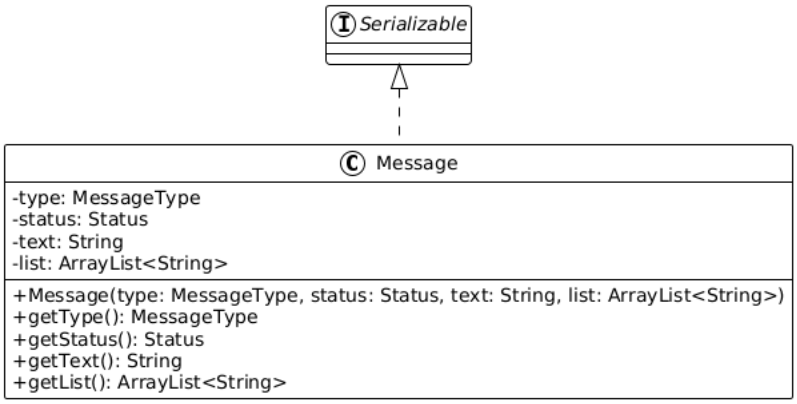
Class 9: Data Manager:

Description: This class will handle the data management, saving and loading of universities, users and courses to and from local file in a directory-based partitioning approach, which helps to keep file-handling logic in one place as well as isolated for different universities.



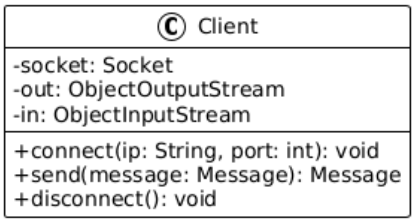
Class 10: Message

Description: This class will act as a serializable class to be sent over a network, which will be used to send request/response back and forth between the client and server. It will also use Enums to encapsulate the MessageType when sending or receiving requests and responses.



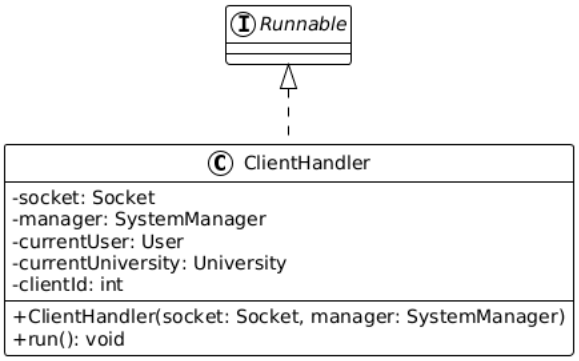
Class 11: Client

Description: This class will act as the interface and point of access to the user to log in and send commands to the server through Message objects. It will contain the GUI for the user and provide two views one for Student user and another for Administrator user. This client class initiates the client application once the user attempts to send a command, such as “LOG_IN”.



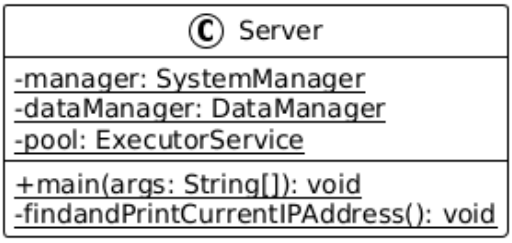
Class 12: Client Handler

Description: This class will allow the system to use a multithreaded client-server design pattern, where the server after connecting to a client, will have this class handle the request/response while the server handles other connections before passing them to this class.



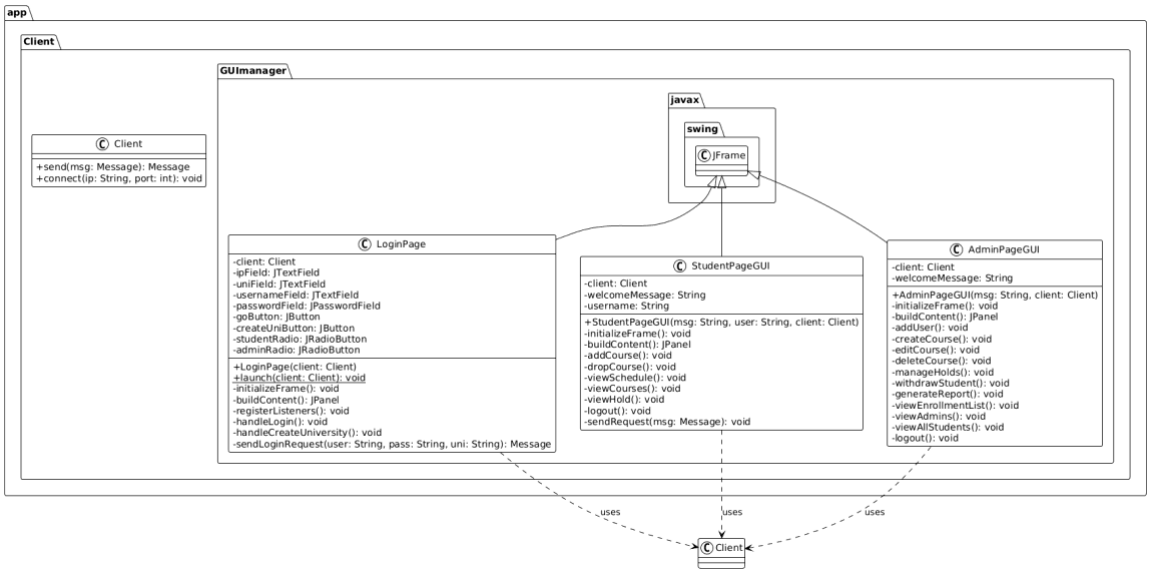
Class 13: Server

Description: This class is the server class, which will start and stop the server application. This application will handle the core business logic and data validation in the system. The server listens to new client connections and will pass them to the clientHandler class one by one, once each connection is established.

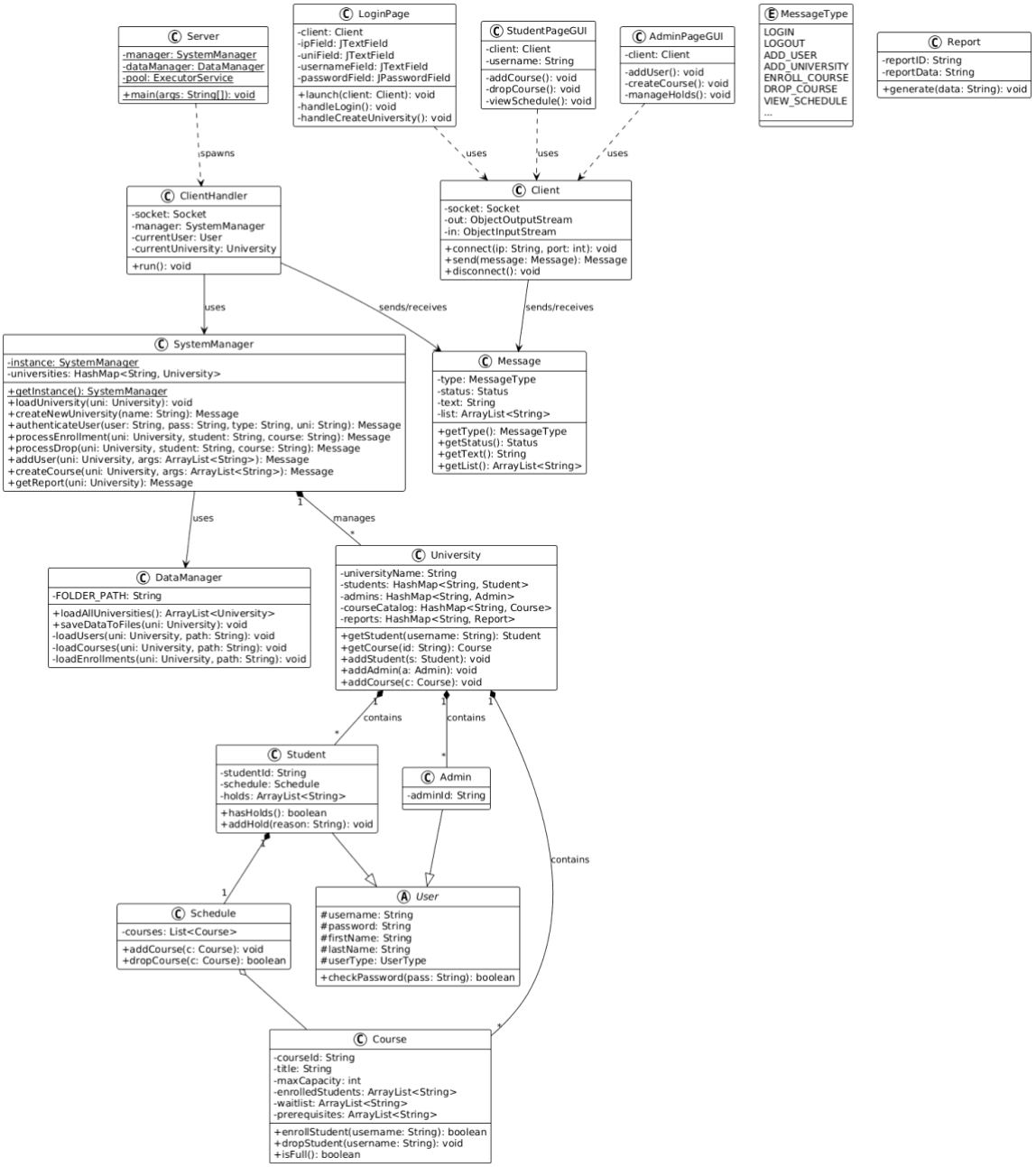


Class 14: GUI Manager (LoginPage, StudentPage, AdminPage, GUI)

Description: This class will manage the GUI for the client, manage the session and display relevant information such as enrollment results, schedule, confirmation messages and exiting the application.



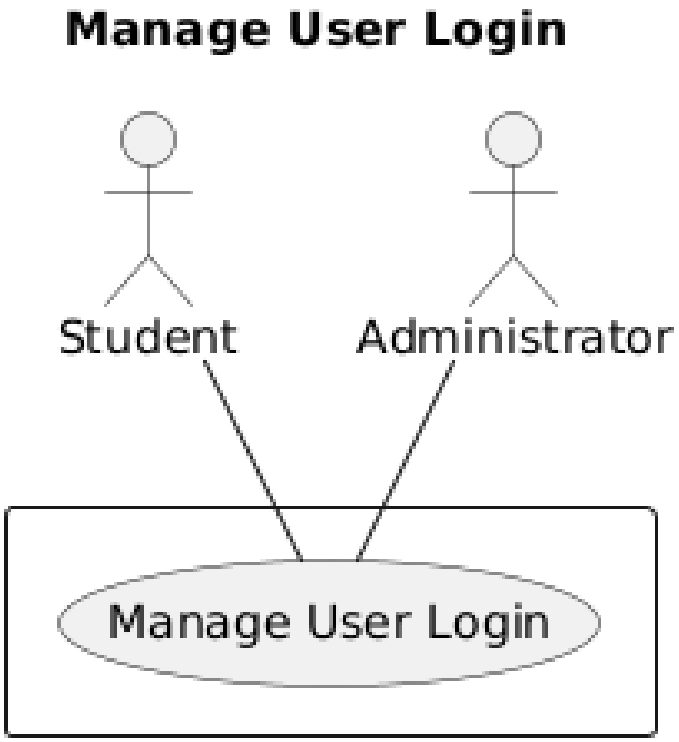
4. Class Diagram



6. Use Cases

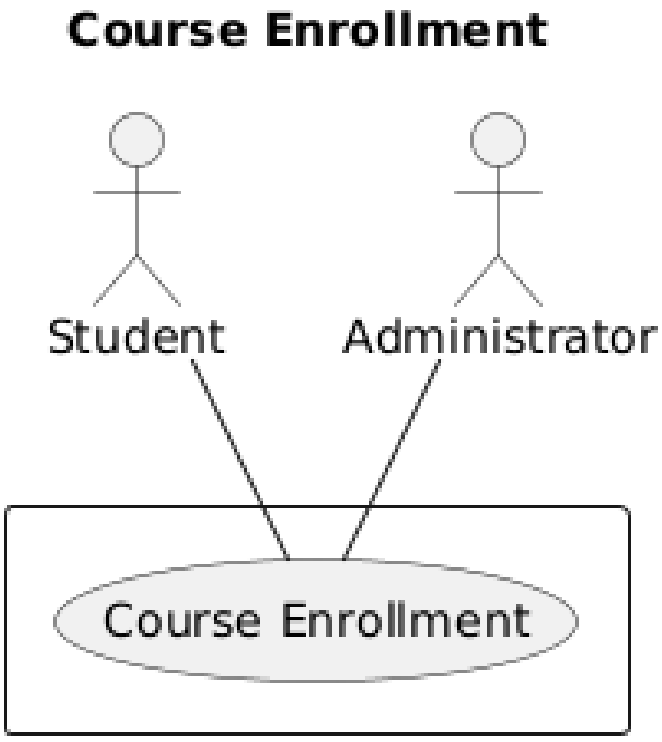
6.1 UC01 : Manage User Login

Actor: Student, Administrator
Description:
This allows the user to enter their username and password on GUI, system manager verifies the input according to credentials file(txt, username, password, role). If it matches, it then directs the client app to Student or Admin interface. If password is invalid, it will display error message and let user to try again.



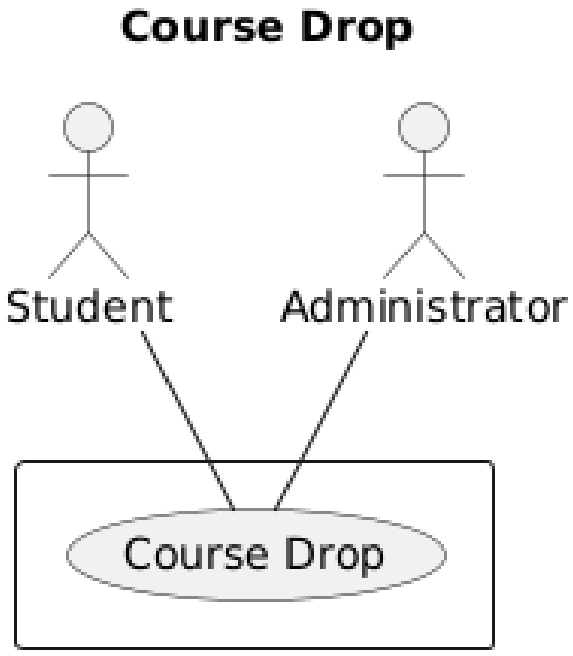
6.2 UC02: Course Enrollment

Actor: Student, Administrator
Description:
This use case allows Students to enroll in courses and Administrators to manage enrollment records.

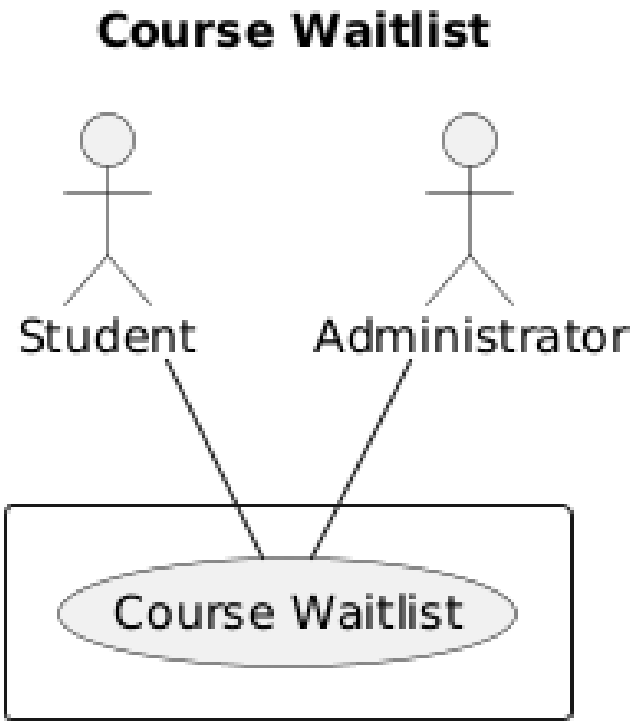


6.3 UC03: Course Drop

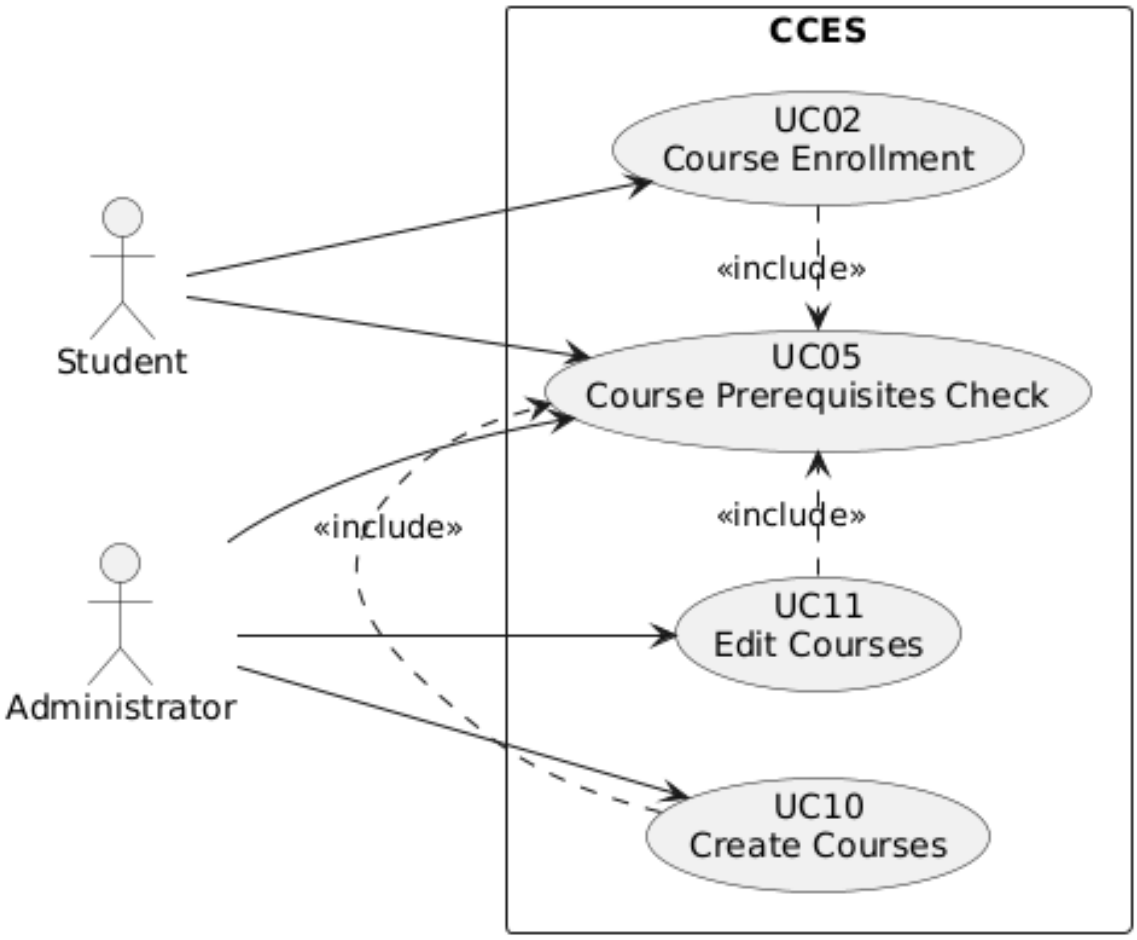
Actor: Student, Administrator
Description:
Allows Students and administrators to drop courses server-side that are already enrolled in and system manager update course drops.



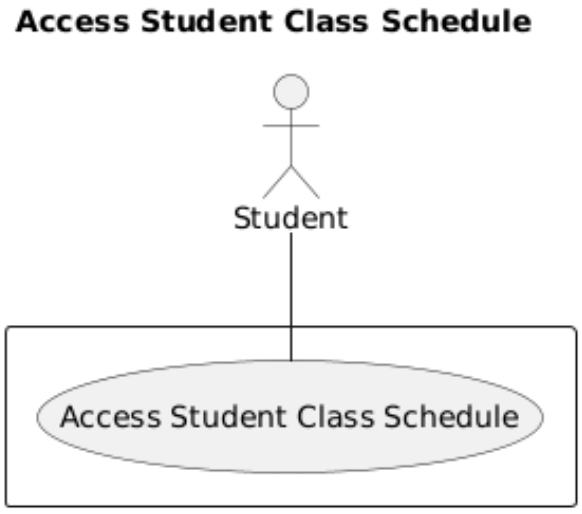
6.4 UC04: Course Waitlist
Actor: Student, Administrator
Description:
This use case manages waitlist size and allows administrators to set and check waitlist size and students to join a waitlist if a particular class is full. The system updates the waitlist as students enroll or drop-in classes.



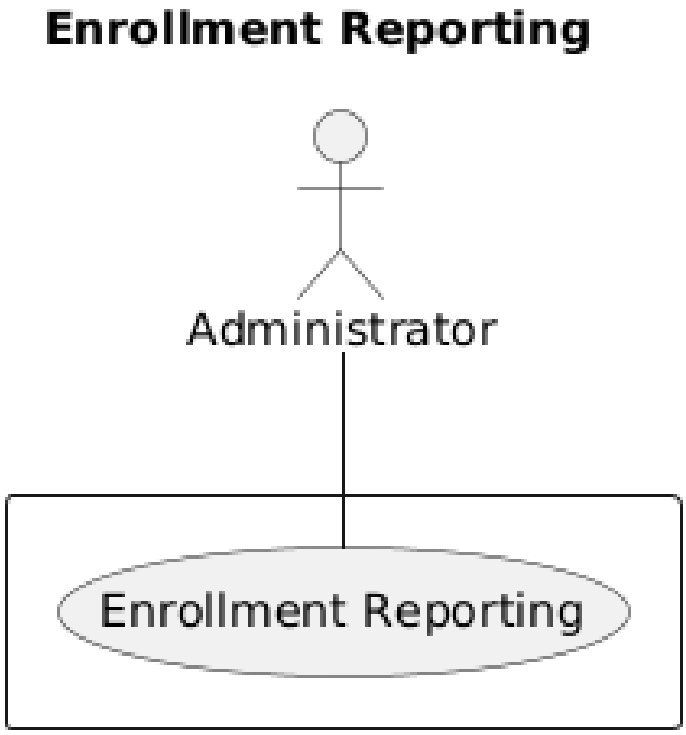
6.5 UC05: Course Prerequisites Check
Actor: Student, Administrator
Description:
Before students enroll in courses, triggering a prerequisite check. Administrators can create and edit prerequisites for every course offered.



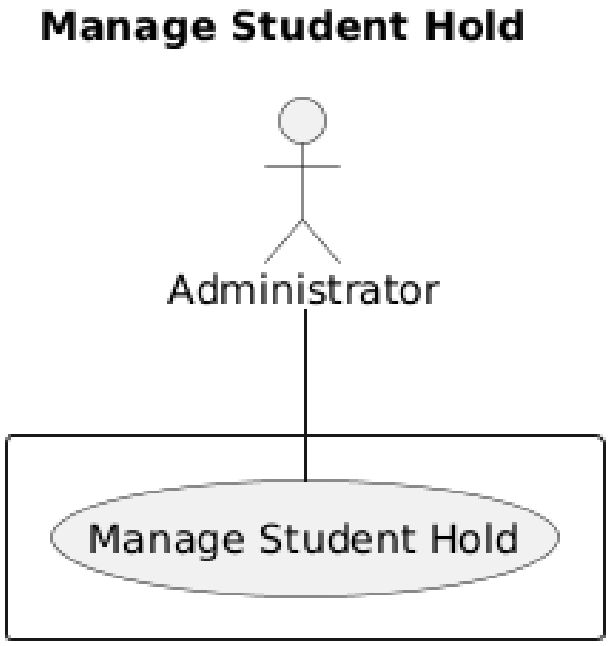
6.6 UC06: Access Schedule
Actor: Student
Description:
This use case allows students to view their current class schedule. The system fetches schedule information and displays it in an organized format for the students.



6.7 UC07: Enrollment Reporting
Actor: Administrator
Description:
This use case allows administrators to generate enrollment reports. The system will get information, formats it into a report, and provides options to display or save.

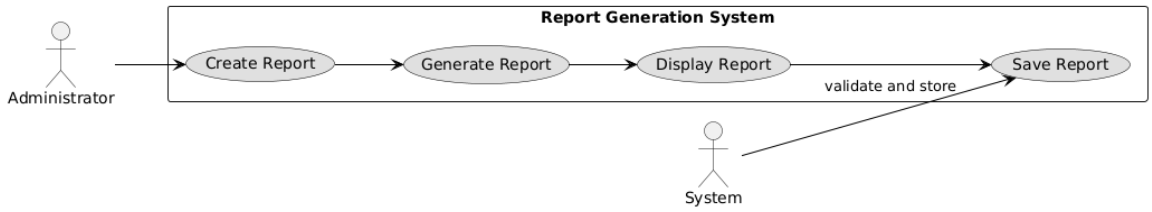


6.8 UC08: Manage Hold
Actor: Administrator
Description:
This use case allows Administrators to add, or remove student holds that restrict course registration.



6.9 UC09: Update Changes Report

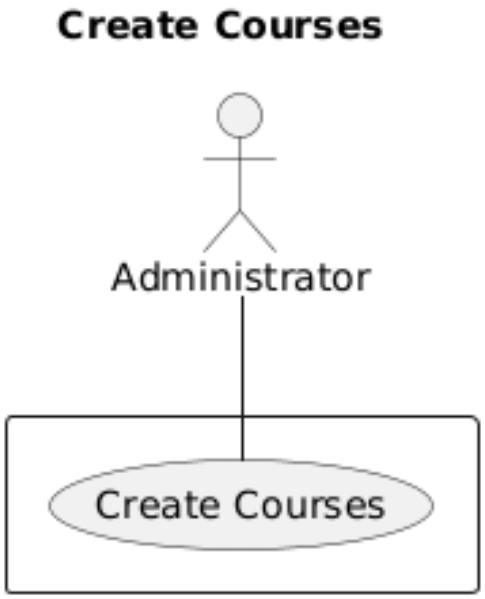
Actor: Administrator, System
Description: This use case allows the Administrator to create, generate, and display updated reports reflecting recent system changes. The System validates the data and stores the final report for future reference.



6.10 UC10: Create Courses

Actor: Administrator

Description: This use case allows administrators to create new courses by entering course details such as course ID, title, subject, schedule, and assigned instructor. The system will check for duplicate course IDs and stores the new course for student to enroll.

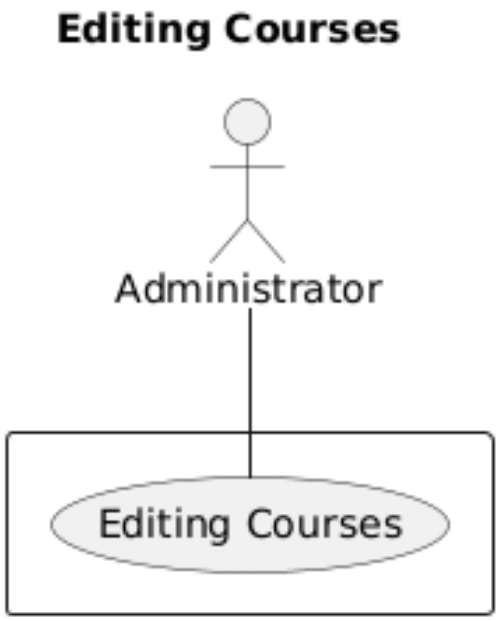


6.11 UC11: Edit Courses

Actor: Administrator

Description:

This use case allows administrators to modify existing course information such as course title, instructor, schedule, or capacity.

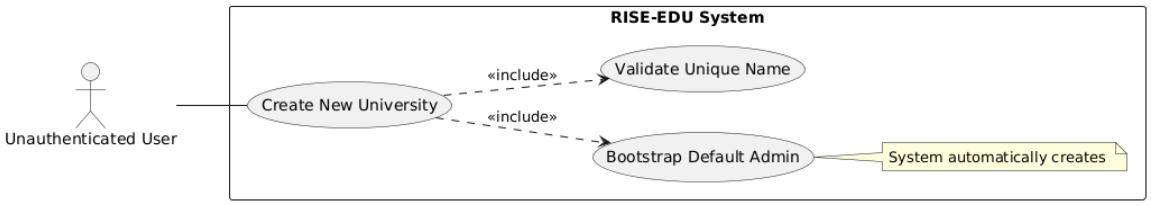


6.1 UC12: Create New University

Actor: Administrators

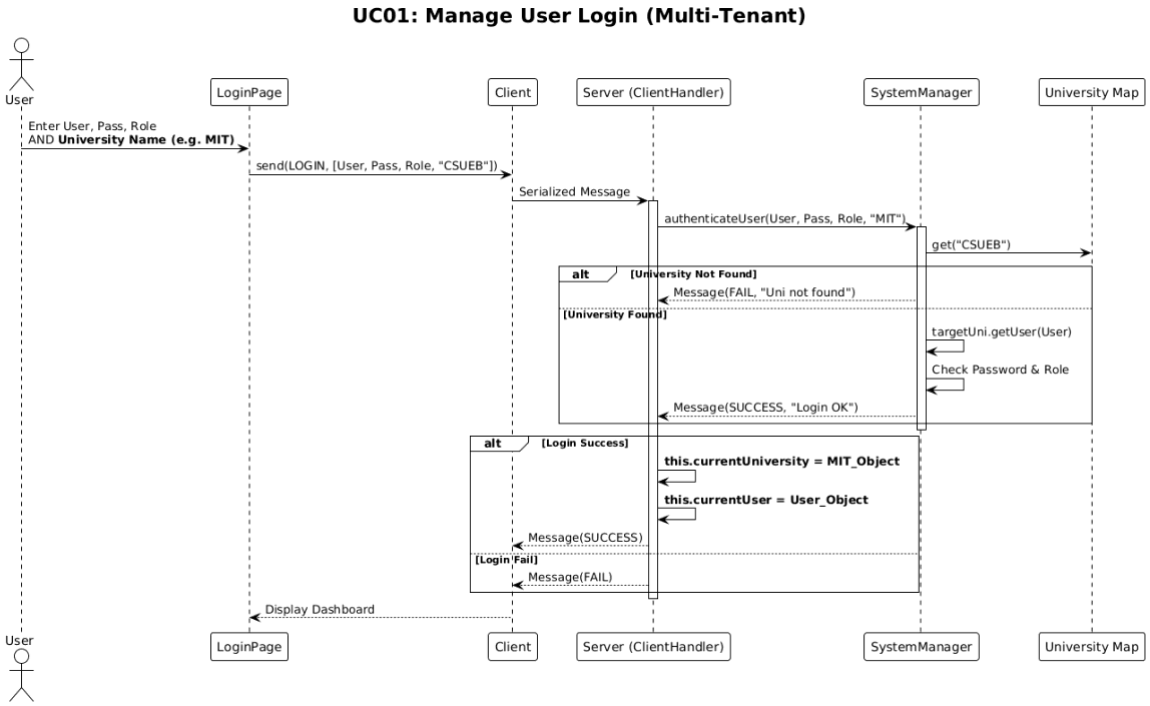
Description:

This use case allows administrators to add a new university if no existing university is in the system, by initializing a new university instance in the system memory then automatically bootstraps default users and courses to associate to that new university. Users can then use the default admin account to add more users, create more courses, edit and delete and apply all the other use cases to this university. The data manager will then save the new university directory upon the server shutdown.

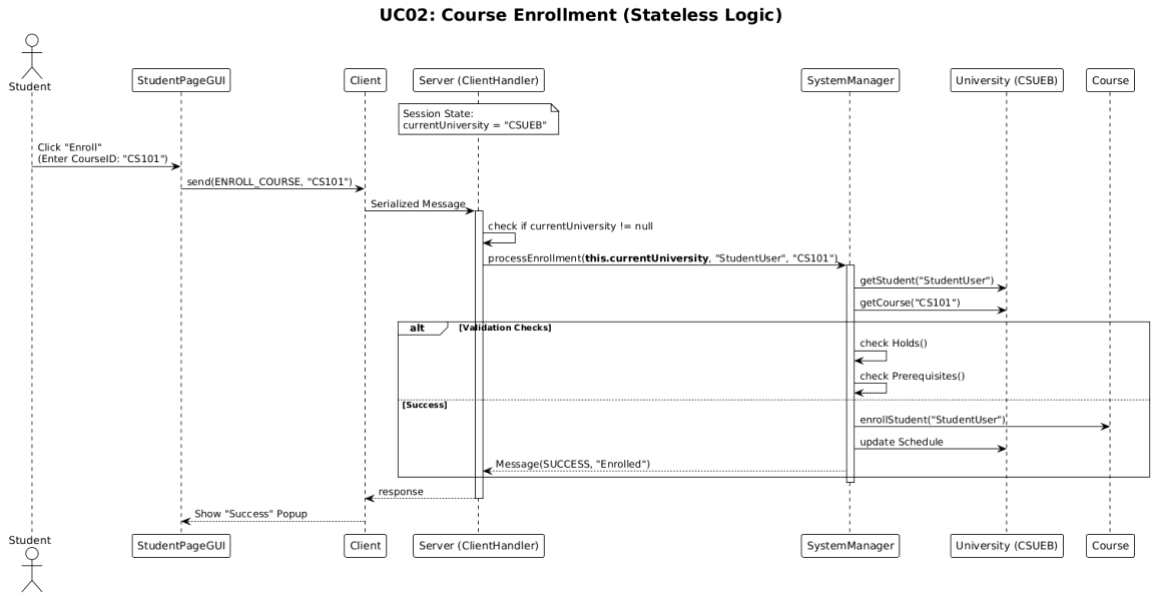


7. Sequence Diagrams

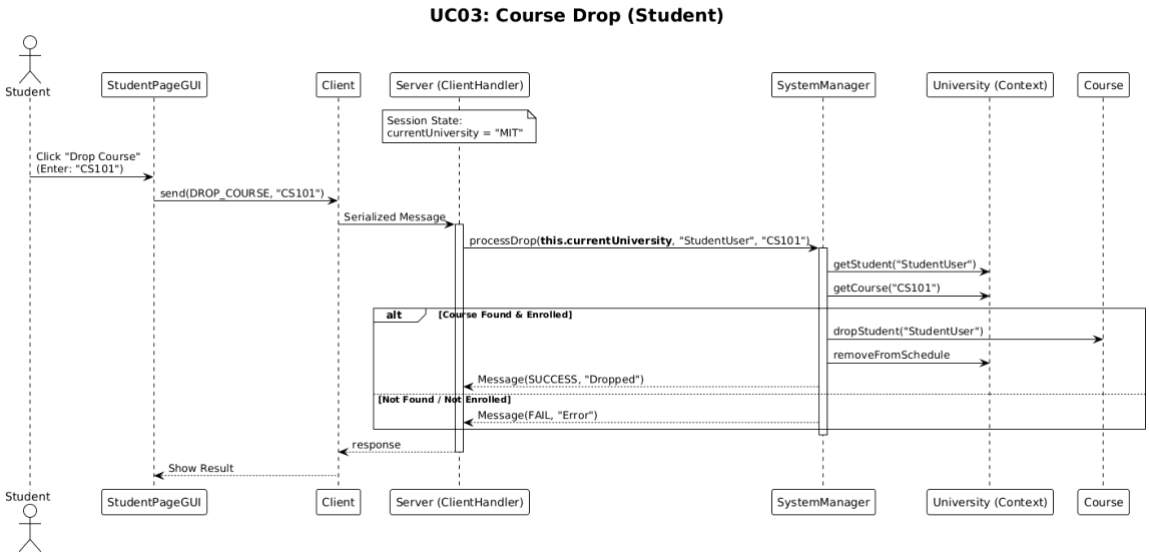
Use Case 1: Manage User Login



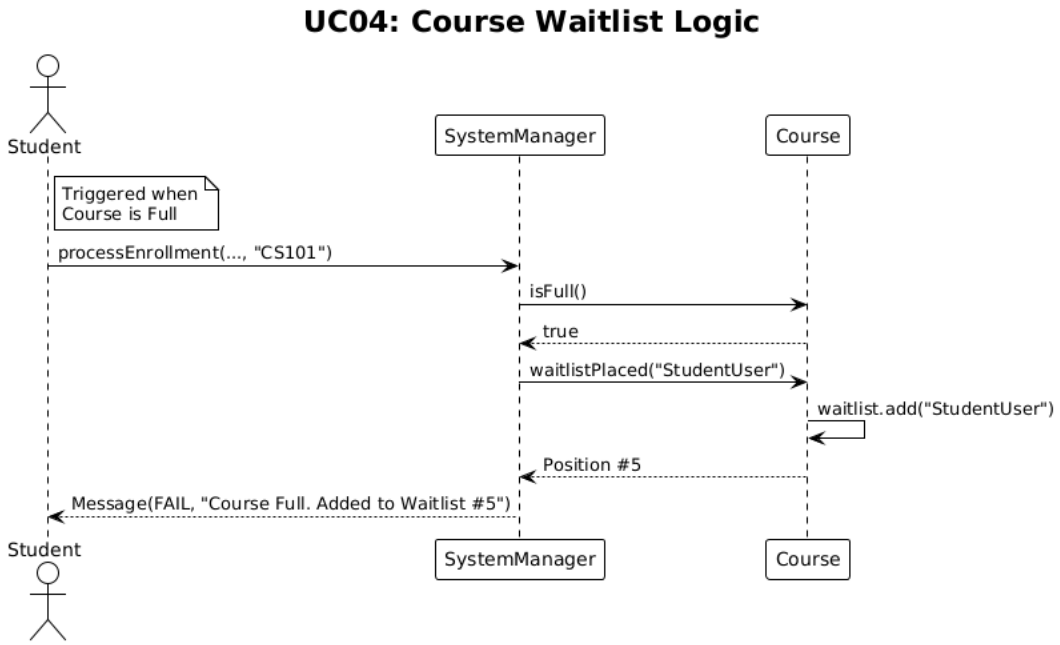
Use Case 2: Course Enrollment



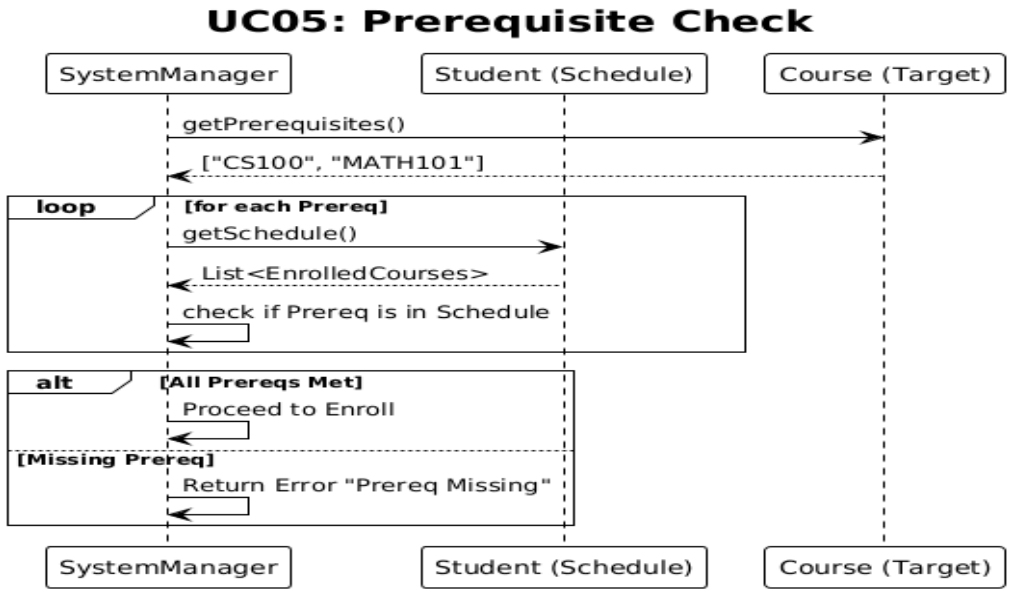
Use Case 3: Course Drop



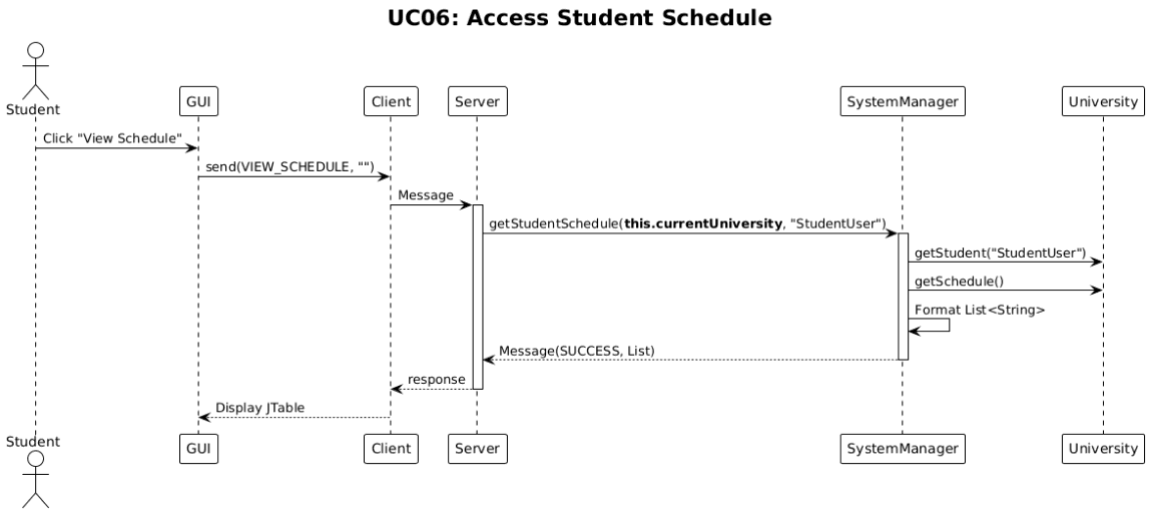
Use Case 4: Course Waitlist



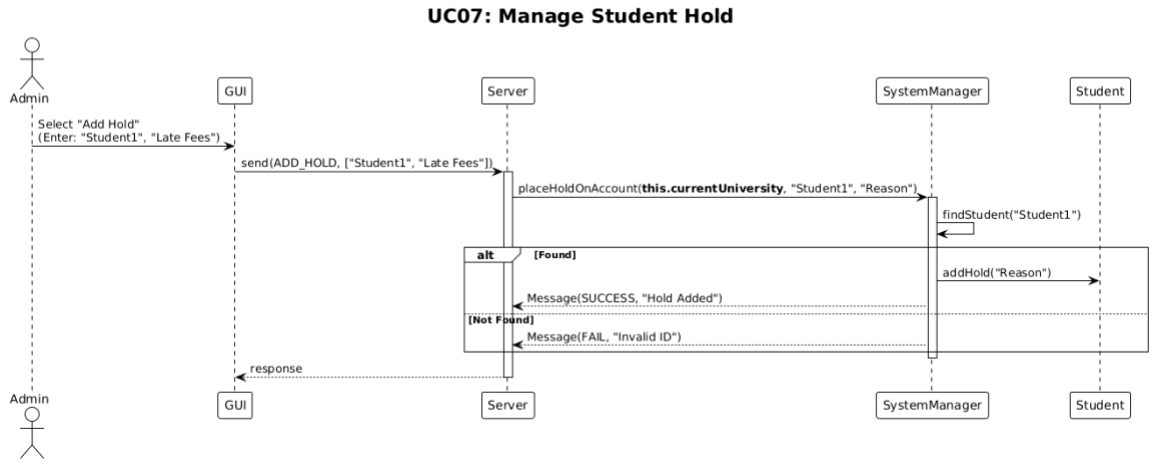
Use Case 5: Course Prerequisites Check



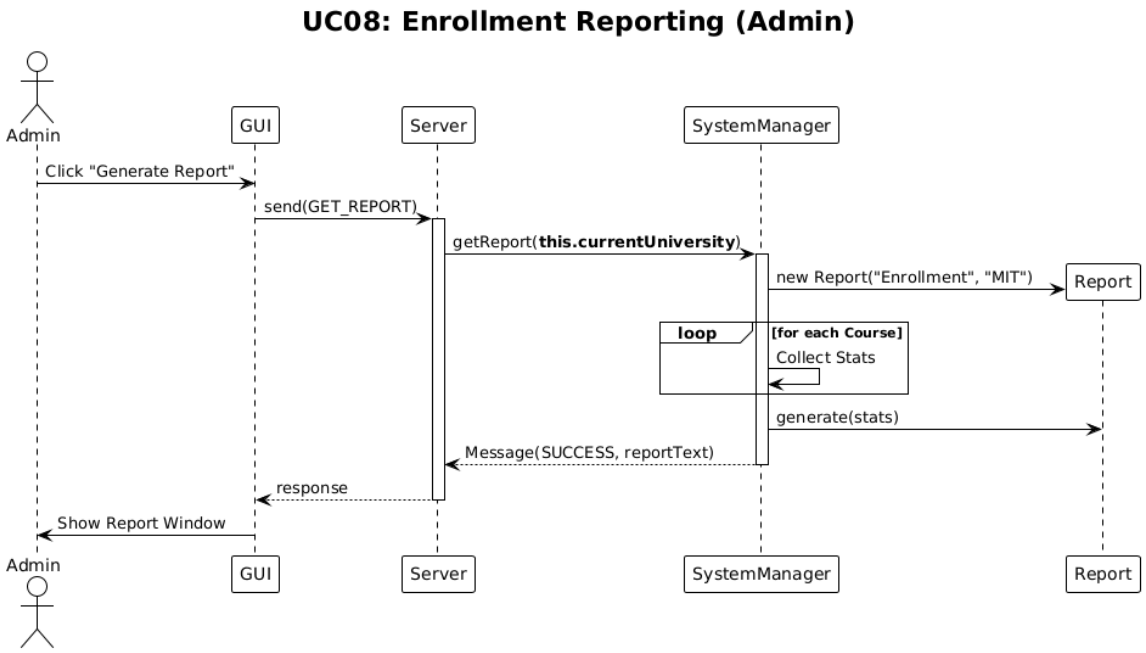
Use Case 6: Access Student Class Schedule



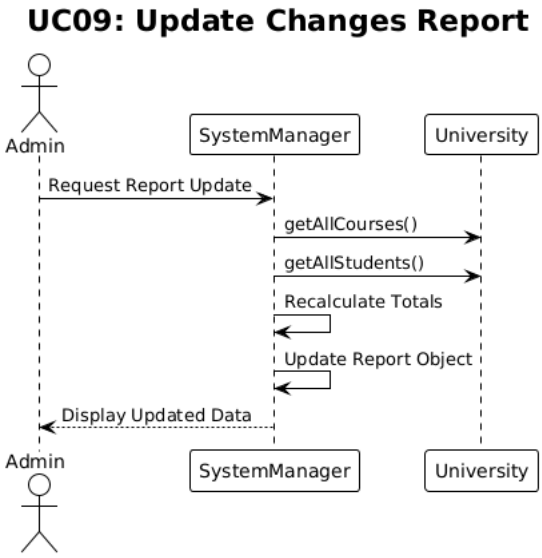
Use Case 7: Manage Student Hold



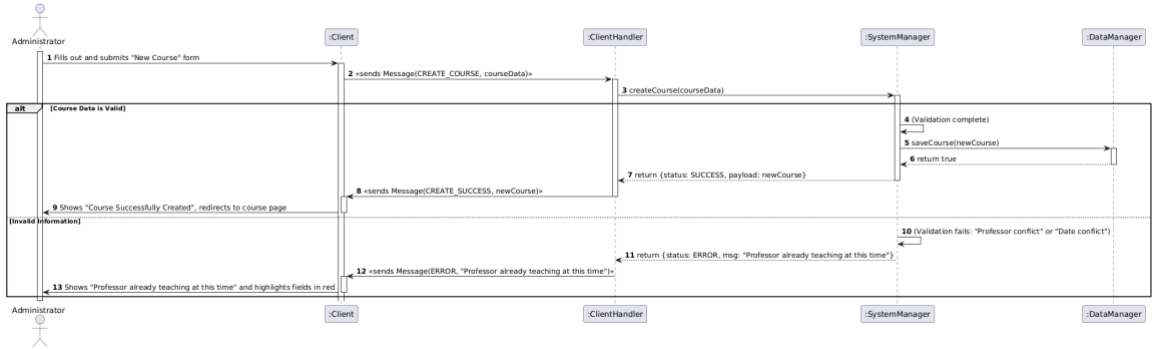
Use Case 8: Enrollment Reporting



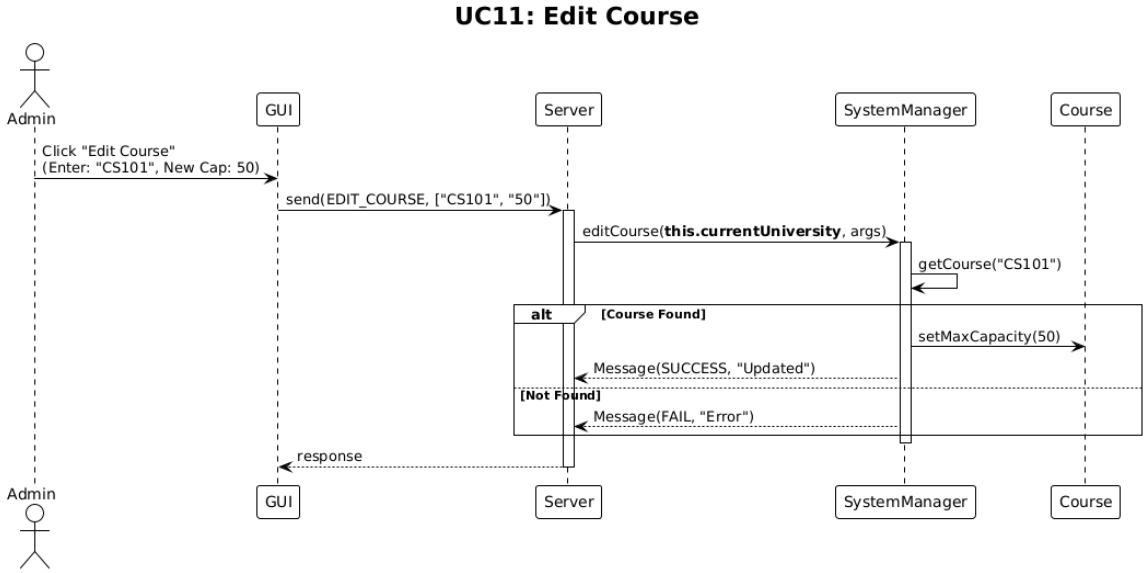
Use Case 9: Update Changes Report



Use Case 10: Create courses



Use Case 11: Editing courses



Use Case 12: Creating New University