FACULTY OF COMPUTING

UNIVERSITI TEKNOLOGI MALAYSIA

DATA STRUCTRUE & ALGORITHM
(MECS0023)

SEMESTER 2 2023/2024

Mini Project Documentation
Student Course Management System

By

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Section 52

Lecturer:
Pang Yee Yong

For Lecturer Use:

Description	Mark Distribution	Mark
Project Report • System Analysis • Design • Program Code	 10 15 25	
Presentation & Demo	25	
System Prototype	25	
Total	100	

MECS0023 DSA - MINI PROJECT SPECIFICATION

PART 1: INTRODUCTION

1.1 Synopsis Project

The project aims to develop a text-based application in C++ that manages course and student registrations using Link List and queues.

1.2 Objective of the project

The objective is to implement a system that efficiently handles student enrolments and course registrations, while utilizing fundamental data structures such as linked lists and queues.

PART 2: SYSTEM ANALYSIS AND DESIGN (USE CASE, FLOWCHART AND CLASS DIAGRAM)

2.1 System Requirements

The system must allow users to:

1. Register a student.
2. Register a course (with a limited number of slots).
3. Enrol a student in a course (if slots are available, otherwise add to a waiting list).
4. De-enrol a student (if there are students on the waiting list, enrol the first student in the queue).
5. Display available courses.
6. Display registered students.

The system has 6 use cases: -

Use Case	**Purpose**
Register a student	Register new student name
Register a course	Register new course
Enrol a student in a course	Enrol student in a course subject
De-enrol a student from a course	Remove a student from enrollment in a course
Display available courses	Checkthe courses that are available
Display registered students	Check the registered students' information

2.2 System Design

The system will be menu-driven, offering options for each functionality mentioned above. The class diagram represents the structure of the system in terms of classes, their attributes, methods, and relationships. It illustrates how different entities such as students, courses, and registrations are modelled in the system.The block diagram belowdivide the flow of processes into register a student, register a course, enrol a student into a course, de-enrol a student from a course, display available courses, and display registered students.

i) Student course management system

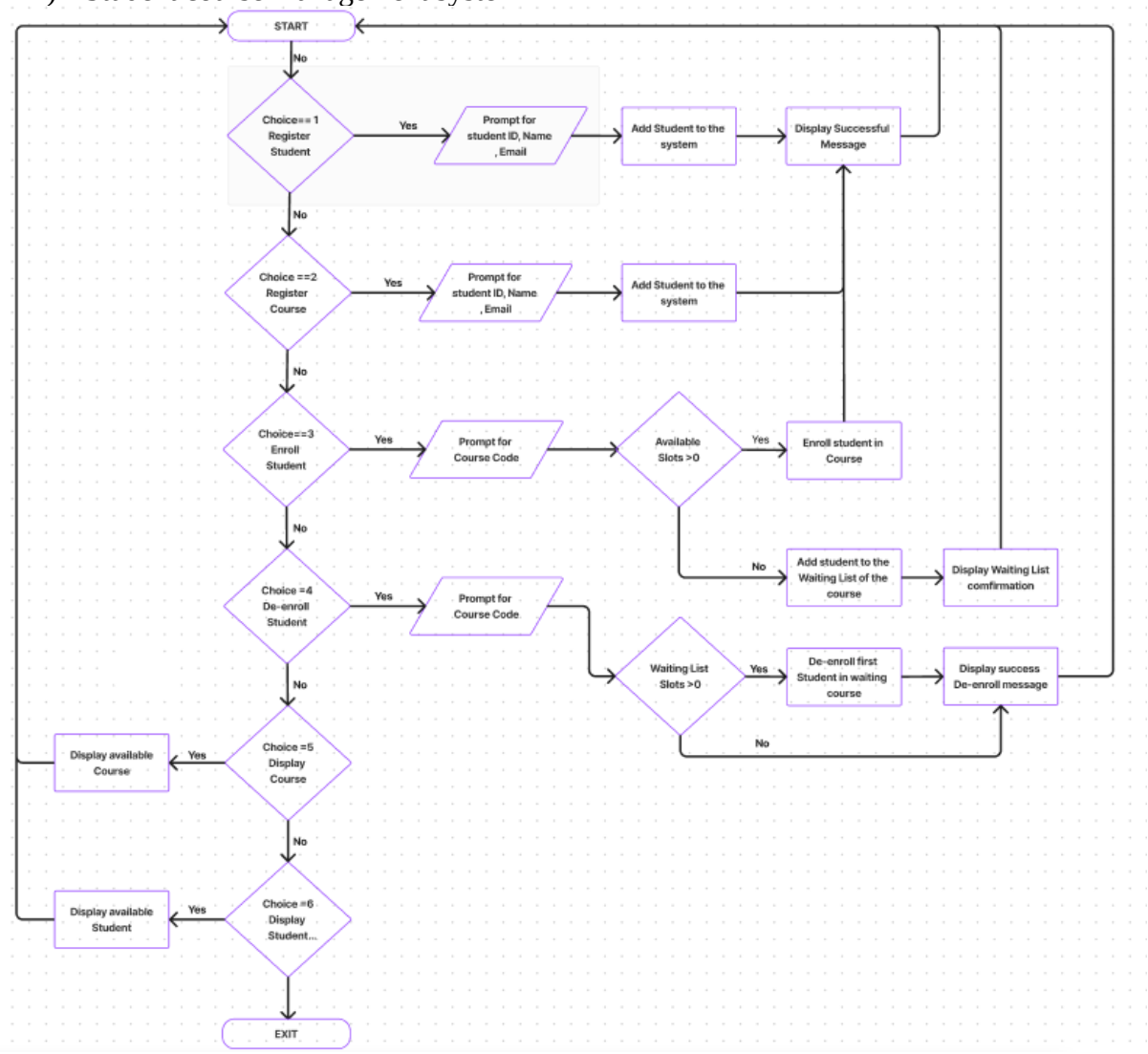


Figure 2.1: Flow chart: Student course management system

ii) Register a student

Figure 2.2: Flow chart: Register a student

iii) Register a course

Figure 2.3: Flow chart: Register a course

iv) Enrol a student in a course

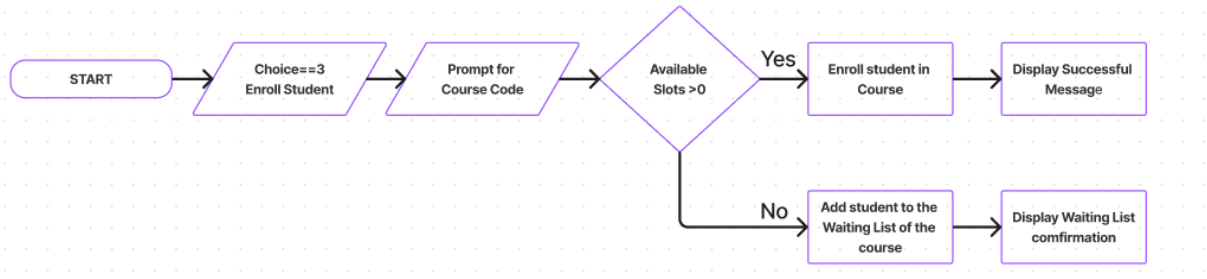


Figure 2.4: Flow chart: Enrol a student in a course

v) De-enrol a student from a course

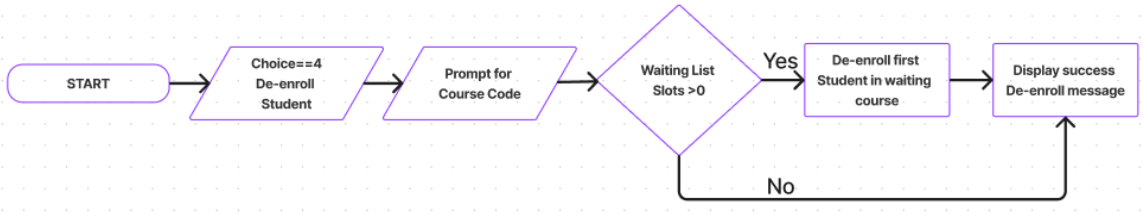


Figure 2.5: Flow chart: De-enrol a student from a course

vi) Display available courses

Figure 2.6: Flow chart: Display available course

vii) Display registered students

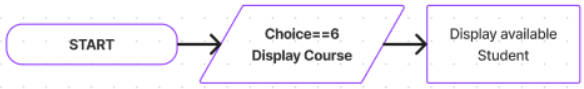
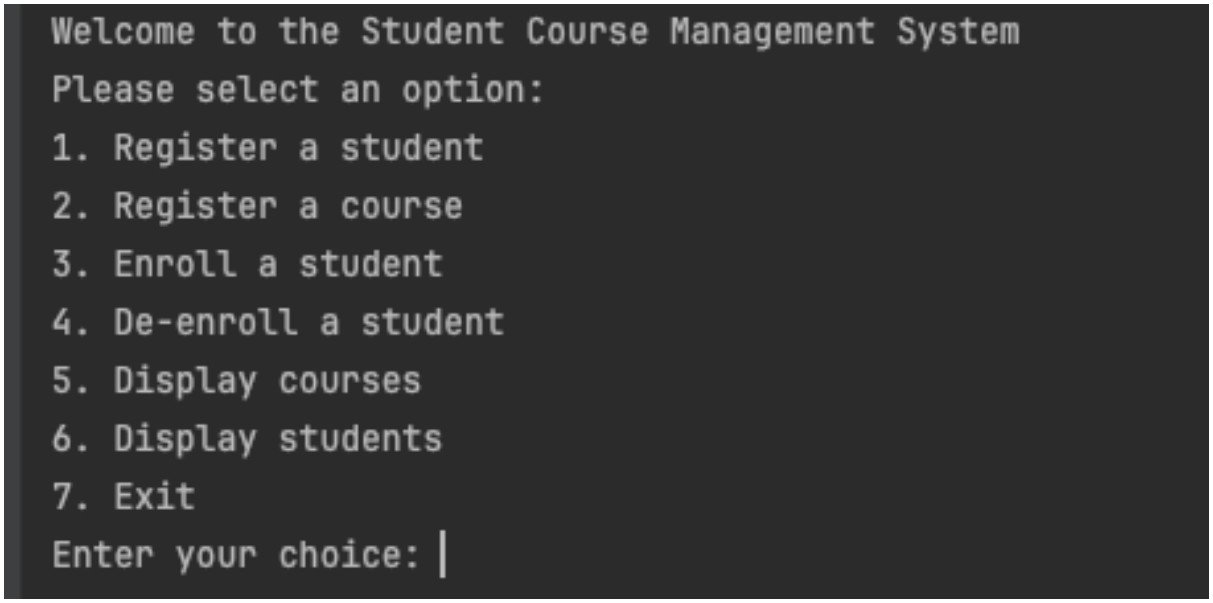
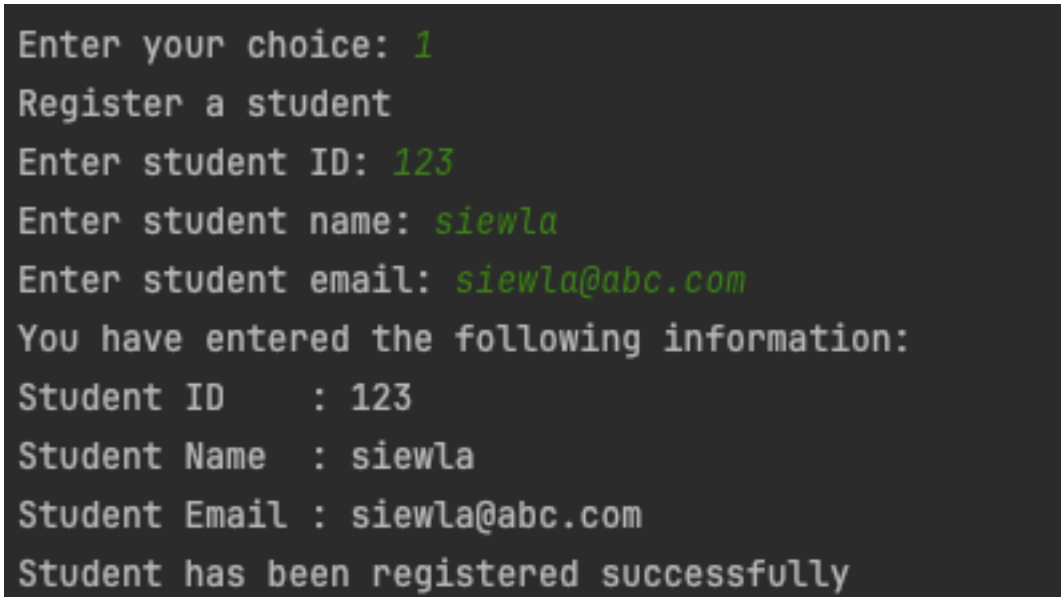


Figure 2.7: Flow chart: Display registered student

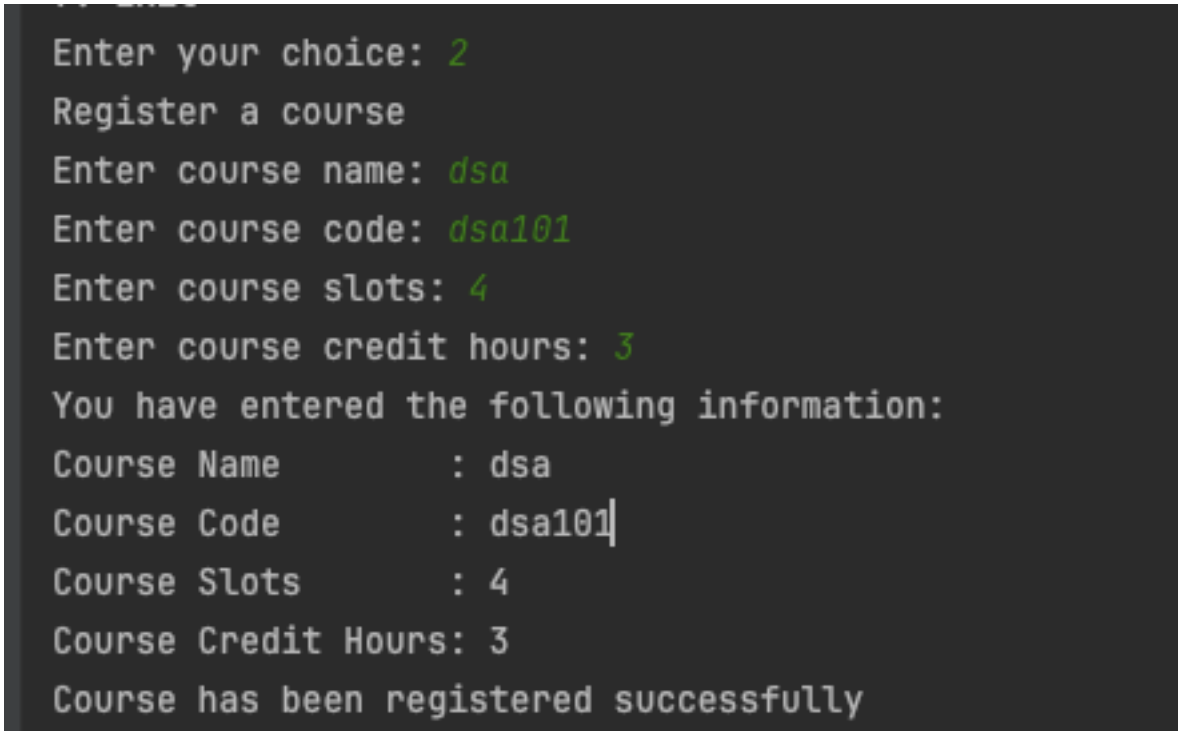
PART 3: SYSTEM PROTOTYPE
A prototype will be developed to demonstrate the core functionalities of the system.



Screen 1: Menu Item
Screen 1: The user must insert an integer value in the range 1-6. If the user enter other number, the system will prompt error message and the screen is displayed again
Prepared By: Siew La



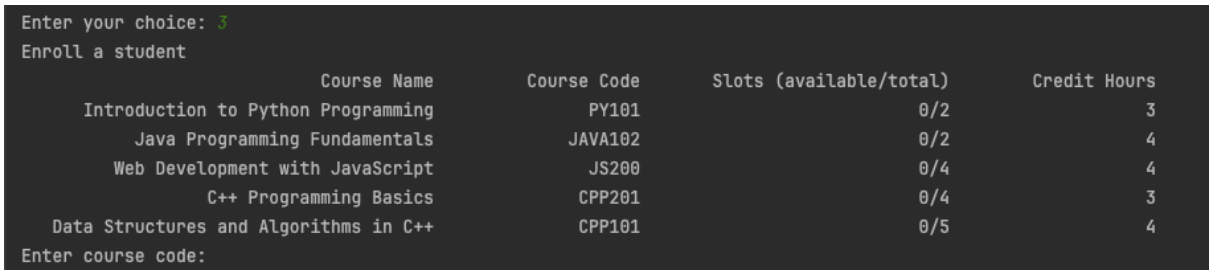
Screen 2: Register A Student
Screen 2: The user will be prompted to enter 3 input, student ID (int), student email (string) and student name (string)
Prepared By: Siew La

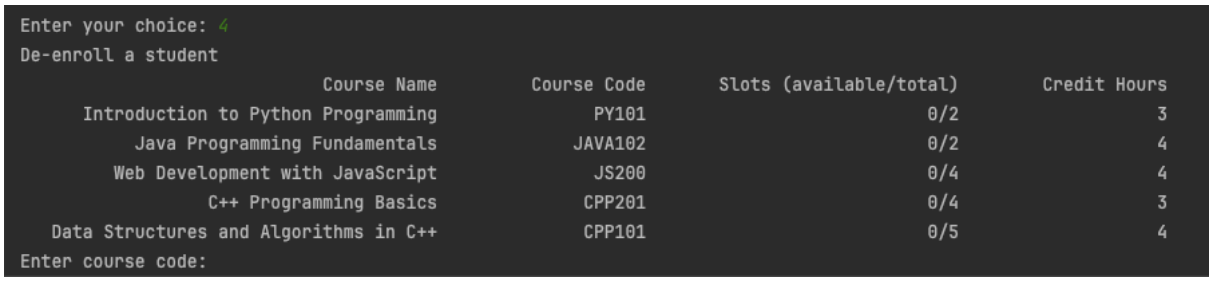


Screen 3: Register A Course

Screen 3: The user will be prompted to enter 4 input, course name (string), course code (string), course slots (int), and credit hours (int).

Prepared By: Siew La





Screen 4: Enrol or de-enrol student

Screen 4: The list of courses will be shown to user, user to input the course code

Prepared By: Siew La

```
Enter course code: JS200
Finding course with code: JS200
1: Display current enrolled students
2: Display students in waitlist
3: Enroll student by matrix number
4: Exit
Enter course code: PY101
Finding course with code: PY101
1: Display current enrolled students
2: Display students in waitlist
3: De-enroll student by matrix number
4: Exit
```

Screen 5: Enrol or de-enrol student Menu

Screen 5: The user must insert an integer value in the range 1-4. If the user enter other number, the system will prompt error message and the screen is displayed again

Prepared By: Siew La

```
Enter your choice: 5
Display courses
                        Course Name        Course Code      Slots (available/total)       Credit Hours
     Introduction to Python Programming             PY101                          0/2                  3
          Java Programming Fundamentals            JAVA102                          0/2                  4
         Web Development with JavaScript              JS200                          0/4                  4
                  C++ Programming Basics             CPP201                          0/4                  3
   Data Structures and Algorithms in C++             CPP101                          0/5                  4
Enter course code to view students:
```

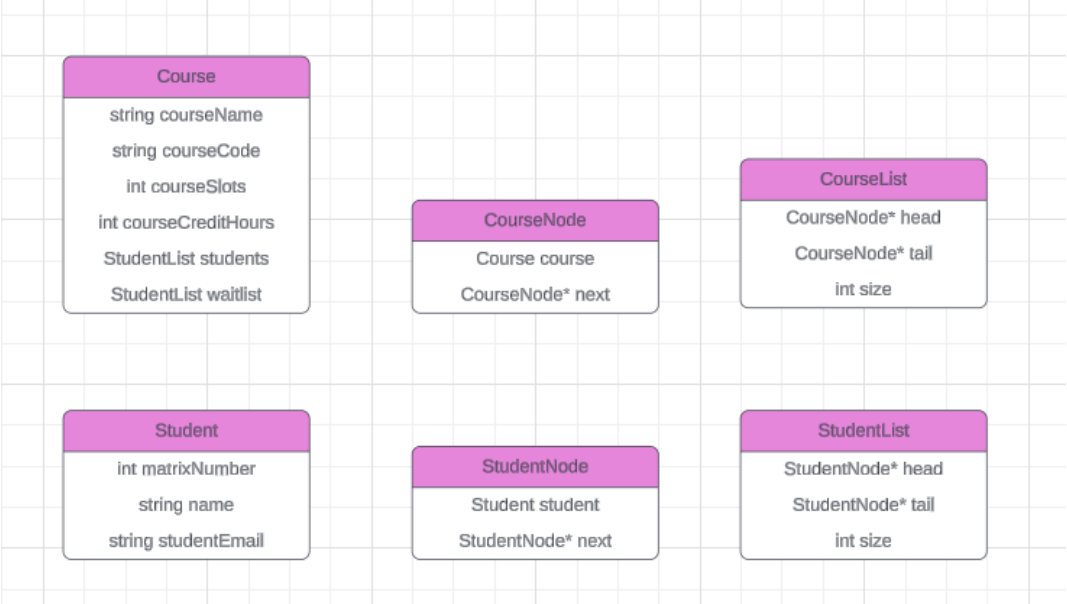
Screen 6: List of Available Course

```
Enter your choice: 6
Display All Students
  Matrix Number                      Name                                Email
           1001                  John Doe                 johndoe@example.com
           1002                Jane Smith               janesmith@example.com
           1003             Alice Johnson            alicejohnson@example.com
           1004                 Bob Brown                bobbrown@example.com
           1005             Sarah Williams           sarahwilliams@example.com
           1006              Michael Davis            michaeldavis@example.com
           1007               Emily Miller             emilymiller@example.com
           1008               David Wilson             davidwilson@example.com
           1009               Susan Taylor             susantaylor@example.com
           1010             James Anderson           jamesanderson@example.com
```

Screen 7: List of All Registered Students

PART 4: UML Diagram

These are the data structure for the application



The UML diagram describes a system where courses and students are managed using linked lists (CourseList and StudentList). Each course (Course) and student (Student) is represented by objects with specific attributes, and linked list nodes (CourseNode and StudentNode) are used to organize and manipulate these objects. This structure supports operations typical of educational systems, such as enrollment, waitlisting, and dynamic management of course capacities.

Component Explanation:

Course

courseName: Name of the course (type: string).
courseCode: Code identifier for the course (type: string).
courseSlots: Number of available slots for students in the course (type: int).
courseCreditHours: Number of credit hours the course is worth (type: int).
students: List of students enrolled in the course (type: StudentList).
waitlist: List of students on the waitlist for the course (type: StudentList).

Student

matrixNumber: Unique identifier for the student (type: int).
name: Name of the student (type: string).
studentEmail: Email address of the student (type: string).

CourseNode

course: Reference to a Course object (type: Course).
next: Reference to the next CourseNode in a linked list structure (type: CourseNode*).

StudentNode

student: Reference to a Student object (type: Student).
next: Reference to the next StudentNode in a linked list structure (type: StudentNode*).

CourseList

head: Reference to the first node (CourseNode) in the linked list of courses.

tail: Reference to the last node (CourseNode) in the linked list of courses.
size: Number of courses in the list (type: int).

StudentList
head: Reference to the first node (StudentNode) in the linked list of students.
tail: Reference to the last node (StudentNode) in the linked list of students.
size: Number of students in the list (type: int).

Relationship Explanation:
Course and Student:

- Course represents a course offered at the educational institution. It has attributes describing its identity (courseName, courseCode), capacity (courseSlots), academic value (courseCreditHours), and lists (students and waitlist) for managing enrolled and waitlisted students.
- Student represents an individual enrolled at the institution, identified uniquely by matrixNumber. It includes basic personal information such as name and studentEmail.

CourseNode and StudentNode:

- CourseNode and StudentNode are helper classes used for implementing linked lists of courses and students, respectively. Each node (CourseNode or StudentNode) contains a reference to either a Course or a Student object (course or student), and a pointer (next) to the next node in the list.

CourseList and StudentList:

- CourseList (CourseLst) and StudentList (StudentList) are collections of courses and students, implemented as linked lists. They maintain references (head, tail) to the first and last nodes of their respective lists, facilitating operations such as insertion, deletion, and traversal. The size attribute keeps track of the number of elements in each list.

Course - Student Relationship:

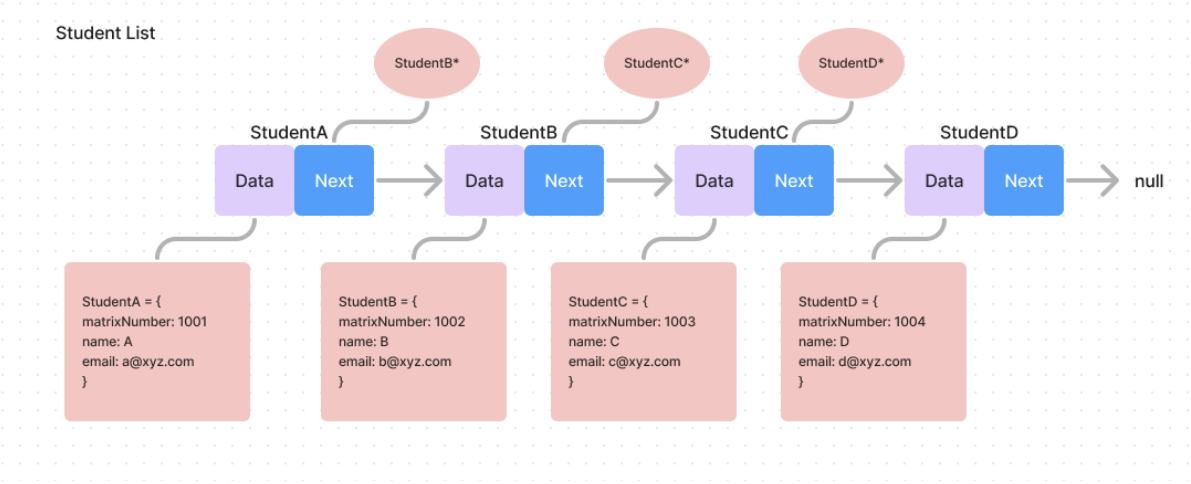
- Each Course object has associations (students and waitlist) with StudentList objects. This allows for efficient management of enrolled students and those on the waitlist for each course.

Node Relationships:

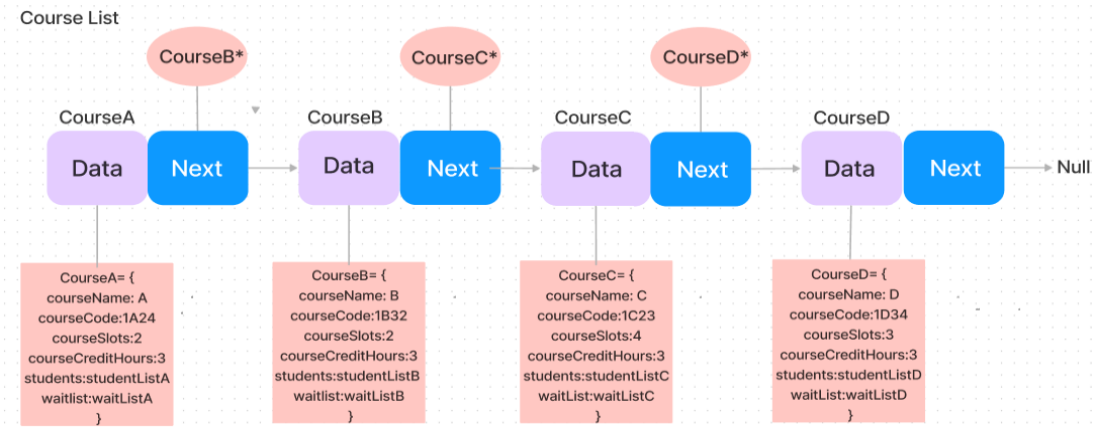
- CourseNode and StudentNode facilitate the implementation of linked lists for courses and students respectively, allowing for dynamic management of collections without fixed size constraints.

The linked list is used in the course list and student list. Whereas the queue is used in the course waitlist list.

i) Student List (Linked List)



ii) Course List (Linked List)



PART 5: DEVELOPMENT ACTIVITIES

Meeting Date	Members Participate in Meeting	Activity	Task for each member	Task Achieved (Yes/No)
5 June 2024	Siew La	Idea Generation	Get the idea approval from Prof	Yes
6 June 2024	Siew La	Do Flow Generation	Complete the overall workflow	Yes
8 June 2024	Siew La	Basic File Structure of the Code	Complete the basic file structure	Yes
9 June 2024	Siew La	Complete the MVP	Complete the MVP	Yes
9 June 2024	Siew La	Draft the initial report	Complete Initial Report Structure	Yes
14 June 2024	Chi Yuan	Refactor Code for V2	Refactor Code to cater for error handling	Yes
17 June 2024	Soo Han	Add Individual Flow chart	Add flow chart to every flow	Yes
18 June 2024	Kai Siang	Refactor Code	Refactor Code to accept lower case for course	Yes
23 June 2024	Siew La	UML Diagram	Draw UML Diagram	Yes
23 June 2024	Siew La	Linked List for StudentList	Draw linked list for StudentList	Yes
23 June 2024	Soo Han	Linked List for CourseList	Draw linked list for CourseList	Yes
24 Jun 2024	Kai Siang	Explain UML Diagram	Elaborate on the UML Diagram	Yes