



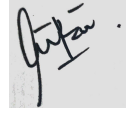
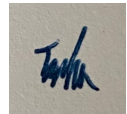

CZ2002 OODP Project

Group 2:

We hereby declare that the attached group assignment has been researched, undertaken, completed and submitted as a collective effort by the group members listed below.

We have honoured the principles of academic integrity and have upheld Student Code of Academic Conduct in the completion of this work.

We understand that if plagiarism is found in the assignment, then lower marks or no marks will be awarded for the assessed work. In addition, disciplinary actions may be taken.

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1. Design Considerations

1.1 Approach Taken

1.1.1 Composition

The idea of composition is used between Course and CourseIndex classes as well as CourseIndex and Lesson classes. A Course has at least 1 index while the index exists because of the course. This means that if the course was removed, the index will not be valid as well. The Course is the whole while the CourseIndex is the part. This relationship holds for CourseIndex and Lesson classes where the CourseIndex is the whole and Lesson is the part. Without the whole, the part will cease to exist.

1.1.2 Aggregation

One example of aggregation is our CourseIndex class and Student class. Every student has their own list of registered indices while every index also has its own list of students registered under it. However, their life cycle is independent of each other. For example, if a student was removed, the index still exists and is valid and the same is true for vice versa. If an index was removed, the student still exists.

1.1.3 Dependency

Dependency can be seen in most of our code where our classes have to make reference to other classes in order to be implemented. For example, the StudentManager class has to refer to the LoginManager class in order to compare whether the username and password that the student had input is correct or not.

1.2 Use of OO Concepts

1.2.1 Abstraction

Initially, we used an abstract class for our Lesson, CourseIndex and Course classes, because all these classes have shared attributes related to the course. However, after writing the attributes for these classes, we decided to do away with the abstract class to make the relationship between Course and Index stronger, ie. a composition relationship as each Course has at least one CourseIndex, and we can get the necessary information from the Course class directly.

1.2.2 Encapsulation / Information hiding

We implemented the idea of encapsulation by making the attributes private and these attributes could be called and modified using getters and setters. We applied the concept of information hiding under the Student class where the method createStudentID() is a private method used to create student IDs every time the admin tries to create a new student.

1.2.3 Inheritance

Serializable was inherited by Course, CourseIndex, Student, Lesson, LoginManager and LoginPage classes. Each of these classes implements Serializable in order to store the data needed for our application to work. This is because every time our main function in Choice is run, we would load the **ArrayList** of students, courses, login timing and login details. Before the program is exited, we would write in the current **ArrayList** into a .ser file. This is necessary in order to save changes made to the students, courses etc. during the runtime of the app. This ensures that each time an admin or student logs in, changes made by other students or admins would be reflected.

1.3 Principles Used

1.3.1 Single responsibility principle

Each class created in our code has only one responsibility. For example, we separated the AdminManager and StudentManager class such that the two different classes are in charge of the two console applications and menus for the admin and student respectively.

1.4 Assumptions made

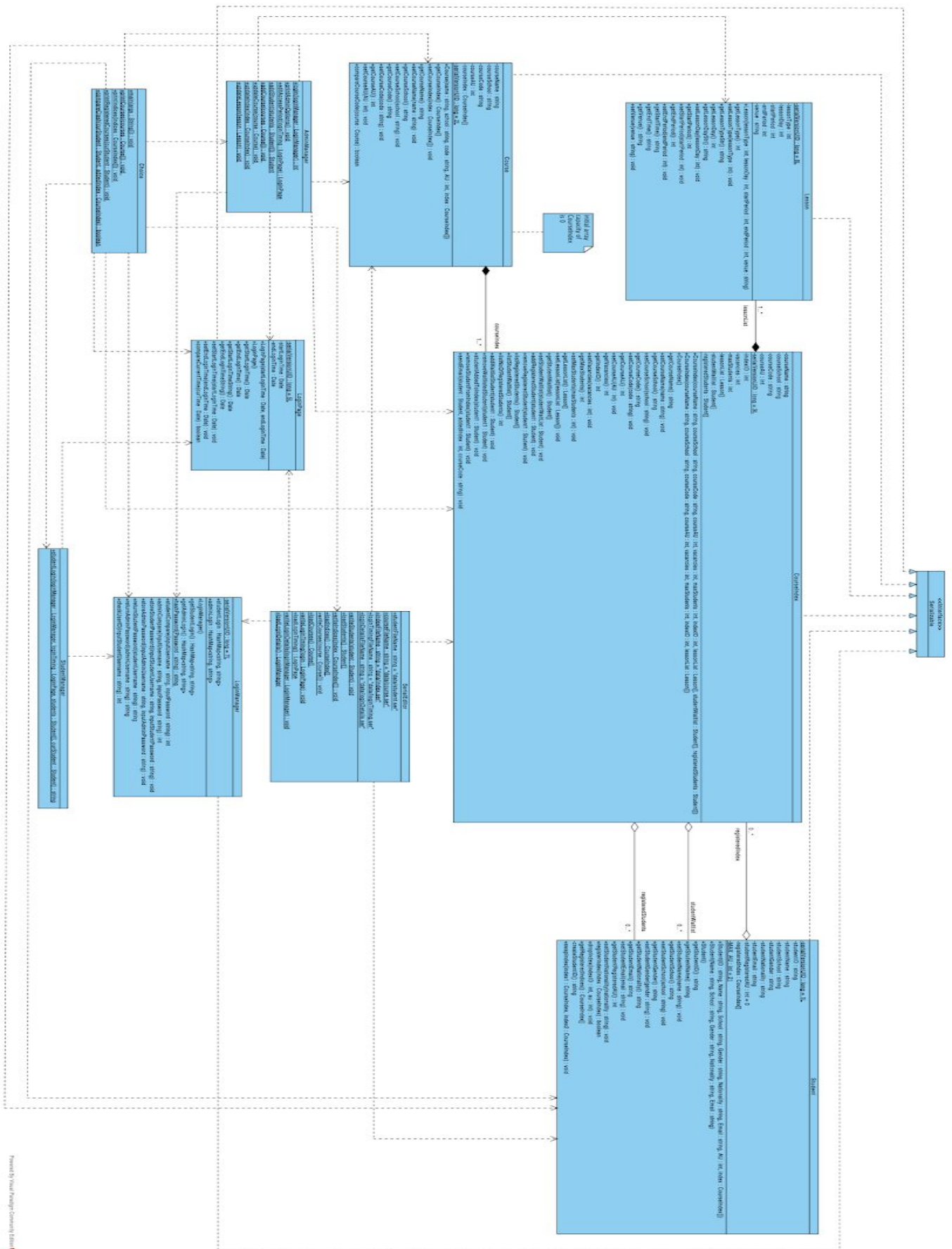
a. Student

- i. The number of Academic Units (AUs) shown refers to both the AUs that the student has successfully registered + the AUs for the courses in the student's waitlist.
 1. Therefore, the maximum AUs for a student would include both registered and waitlisted courses, and a student cannot add courses if it exceeds the max AUs even if all the courses he has added are in the waitlist.
- ii. A student cannot add a course if that course clashes with his existing courses or any courses in his waitlist.
- iii. A student can register for any course regardless of which school the course belongs to.
- iv. When the student swaps an index with a friend, the friend must be registered to the course.
- v. All students have the same number of maximum AUs they are allowed to take, ie. 21 AUs.
- vi. Once a course has a vacant spot, students in the waitlist are added to the course based on a queue system and hence on a first-in first-out basis.

b. Admin

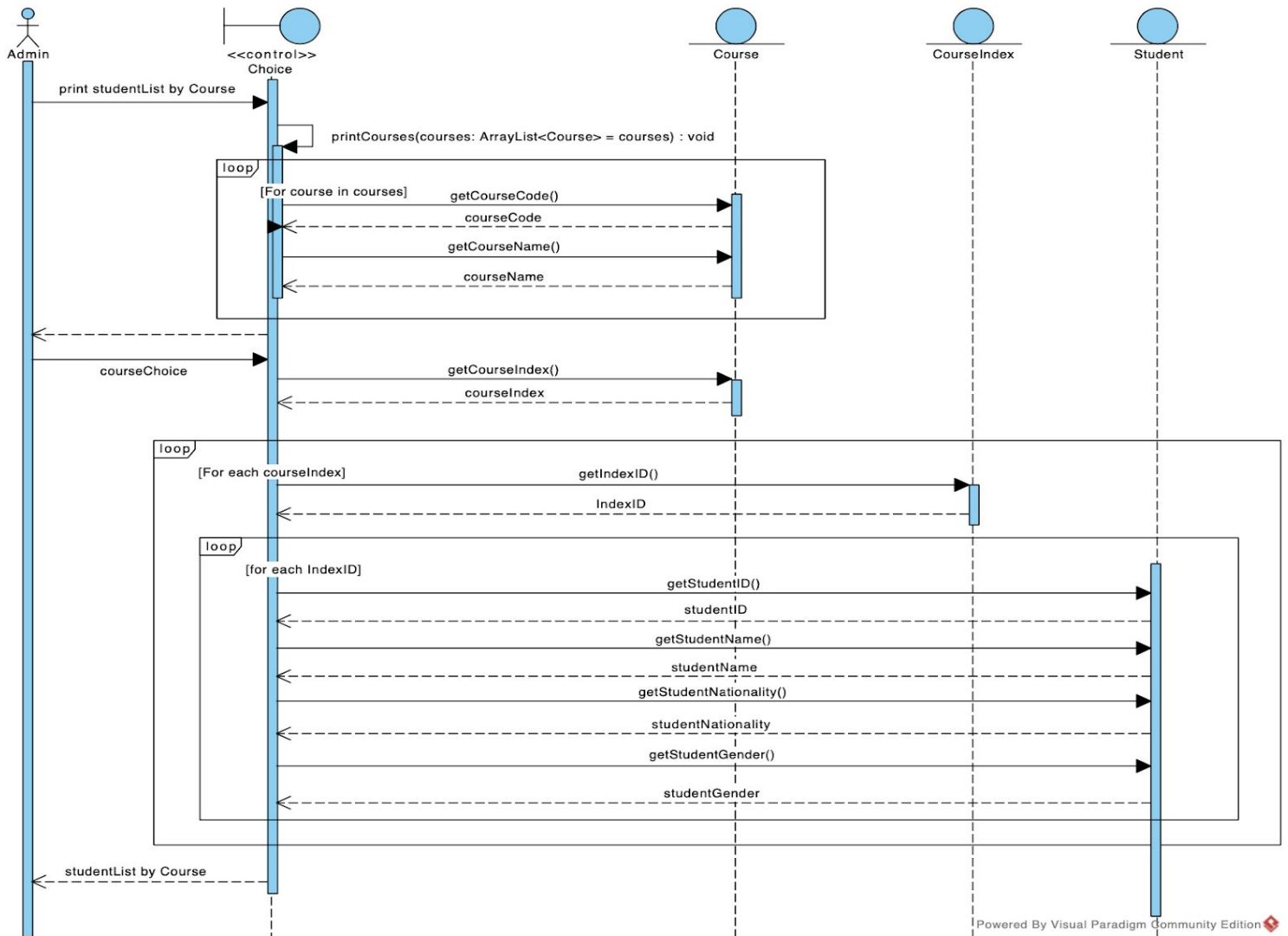
- i. Each student has a unique name, thus the system does not allow for the admin to register another student with the same name
- ii. A student can be either male or female only
- iii. Each course has a unique name and course code

2. UML Class Diagram



3. UML Sequence Diagram

Before the admin prints the student list by courses, an AdminManager controller is called. However, for this particular sequence diagram, the Choice class acts as both a controller and a boundary class.




4. Testing

Student:

Test Case	Outcome
Login before access period:	<pre> Welcome to NTU Stars! 1. Admin 2. Student 2 Please try again during the stipulated time! Start login time: Fri Nov 20 14:30:00 SGT 2020 End login time: Mon Nov 30 11:30:00 SGT 2020 Thanks for using NTU Stars. </pre>
Login after allowed period:	<pre> Welcome to NTU Stars! 1. Admin 2. Student 2 Please try again during the stipulated time! Start login time: Fri Nov 20 14:30:00 SGT 2020 End login time: Mon Nov 30 11:30:00 SGT 2020 Thanks for using NTU Stars. </pre>
Keying in the wrong password:	<pre> Welcome to NTU Stars! 1. Admin 2. Student 2 Please type your Student ID: U1141425C Please type your password: Wrong Username or Password. Please try again Please type your password: </pre>
Add a course index with available vacancies:	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 11 5 These are your registered courses (with waitlisted courses): 1 71050 Probability and Introduction to Statistics 2 71048 Chinese Semantics Choose the course to change index: 1 1) Index ID:71050 Vacancy:19 Index Total Size:20 Waitlist Size:0 2) Index ID:71051 Vacancy:20 Index Total Size:20 Waitlist Size:0 3) Index ID:71052 Vacancy:20 Index Total Size:20 Waitlist Size:0 4) Index ID:71054 Vacancy:20 Index Total Size:20 Waitlist Size:0 Choose new index: 2 Index added successfully! U1141425C </pre>
Add a course with 0 vacancies:	Student is waitlisted:

	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 0 1 Choose the course to be added: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology Choose course to be added: 3 1) Index ID: 17048 Index Vacancy:0 Index Total Size:50 Index Waitlist Size:0 ===== Seminar Monday 1030-1130 TR+64 Choose index to be added: 1 Index added successfully! </pre>
Registering the same course:	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 21 1 Choose the course to be added: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology Choose course to be added: 2 You have been registered or are in the waitlist for this course. Please drop the index before trying to add. Thanks </pre>
Registering a course but with invalid data entry:	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 0 1 Choose the course to be added: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology Choose course to be added: 7 The course does not exist. Please enter a valid number from the option given above Choose course to be added: </pre>
Dropping a course:	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 15 2 These are your registered courses (with waitlisted courses): ===== 1 149 Derivative Securities 2 17048 Chinese Semantics ===== 3 71054 Probability and Introduction to Statistics Choose the course to be dropped: 2 U1918893C Done </pre>

Print list of registered courses:	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 11 3 These are your registered courses: Confirmed course: 71051 Probability and Introduction to Statistics Waitlisted course: 17048 Chinese Semantics </pre>
Check for vacancy in course index:	<pre> Choose index to view vacancies: 4 1) Index ID: 148 Index Vacancy:50 Index Total Size:50 Index Waitlist Size:0 ----- Seminar Wednesday 830-1230 S4-SR2 2) Index ID: 149 Index Vacancy:50 Index Total Size:50 Index Waitlist Size:0 ----- Seminar Thursday 830-1230 LHS-TR+47 </pre>
Checking vacancy for an index with invalid input:	<pre> Choose the course to view vacancies: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology Choose index to view vacancies: 6 The course does not exist. Please enter a valid number from the option given above Choose index to view vacancies: 4 </pre>
Adding a course index with available index but has clash with a registered course:	<pre> Choose the course to be added: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology Choose course to be added: 2 1) Index ID: 70089 Index Vacancy:50 Index Total Size:50 Index Waitlist Size:0 ----- Lecture Wednesday 1330-1430 online Lecture Thursday 1330-1530 online Tutorial Thursday 1030-1130 SPMS-TR+5 Lab Monday 1330-1630 CBC Lab Choose index to be added: 1 There is a clash </pre>
Waitlist student gets added to course:	<p>Before:</p> <pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 11 3 These are your registered courses: Confirmed course: 71051 Probability and Introduction to Statistics Waitlisted course: 17048 Chinese Semantics </pre>

	<p>After:</p> <pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 11 3 These are your registered courses: Confirmed course: 71051 Probability and Introduction to Statistics Confirmed course: 17048 Chinese Semantics </pre>
Email notification sent to student after successfully adding course:	<p>Successfully Added Course Notification (automatic email) Inbox</p> <p> dummyemailforoopd@gmail.com to me ▾</p> <p>Dear Student,</p> <p>Index17048of courseHC4050 has been successfully added to your timetable!</p>
Swapping course index with another student:	<pre> Welcome to NTU Stars Planner! 1. Add Course 2. Drop Course 3. Check/Print Courses Registered 4. Check Vacancies Available 5. Change Index Number of Course 6. Swap Index Number with Another Student 7. Exit No of current AUS: 11 6 These are your registered courses (with waitlisted courses): 1 17048 Chinese Semantics 2 71054 Probability and Introduction to Statistics Choose the course to change index: 2 This is for the student you are swapping with: Please type your Student ID: U1918893C Please type your password: Index added successfully! Index added successfully! finished swapping students changing new index changing old index </pre>
Swap course index but invalid input of other students user ID:	<pre> These are your registered courses (with waitlisted courses): 1 71050 Probability and Introduction to Statistics Choose the course to change index: 1 This is for the student you are swapping with: Please type your Student ID: U1191236 User ID does not exist. Please try again </pre>
Changing course index within list of course indices:	<pre> These are your registered courses (with waitlisted courses): 1 71050 Probability and Introduction to Statistics 2 17048 Chinese Semantics Choose the course to change index: 1 1) Index ID:71050 Vacancy:19 Index Total Size:20 Waitlist Size:0 2) Index ID:71051 Vacancy:20 Index Total Size:20 Waitlist Size:0 3) Index ID:71052 Vacancy:20 Index Total Size:20 Waitlist Size:0 4) Index ID:71054 Vacancy:20 Index Total Size:20 Waitlist Size:0 Choose new index: 2 Index added successfully! </pre>

<p>Change course index but invalid input of other index:</p>	<pre>7. Exit No of current AUS: 6 5 These are your registered courses (with waitlisted courses): ----- 1 71051 Probability and Introduction to Statistics Choose the course to change index: 1 1) Index ID:71050 Vacancy:20 Index Total Size:20 Waitlist Size:0 2) Index ID:71051 Vacancy:19 Index Total Size:20 Waitlist Size:0 3) Index ID:71052 Vacancy:20 Index Total Size:20 Waitlist Size:0 4) Index ID:71054 Vacancy:20 Index Total Size:20 Waitlist Size:0 Choose the index to change to: 5 The index does not exist. Please enter a valid number from the option given above Choose the index to change to: 6 The index does not exist. Please enter a valid number from the option given above Choose the index to change to: 2</pre>
<p>Change course index but other index is full:</p>	<p>Student will be put into waitlist</p> <pre>1) Index ID:71050 Vacancy:0 Index Total Size:20 Waitlist Size:0 2) Index ID:71051 Vacancy:0 Index Total Size:20 Waitlist Size:0 3) Index ID:71052 Vacancy:0 Index Total Size:20 Waitlist Size:0 4) Index ID:71054 Vacancy:19 Index Total Size:20 Waitlist Size:0 Choose new index: 1 Index added successfully! ----- These are your registered courses: Waitlisted course: 71050 Probability and Introduction to Statistics</pre>

Admin:

Test case	Outcome
Adding a new student successfully:	<pre> Input new Student name: Lee Zhong Zin Student already exists! Please input a new student Input new Student name: Lee Chong Chin Input new Student school: HSS Input new Student gender (M/F): B Not valid entry! Insert either M or F Input new Student gender (M/F): F Input new Student nationality: Palestinian Input new Student email: bscc@hotmail.com Updated student list: 1 U1888199C Sarah Lim 2 U1362575C Hazel Wang 3 U1939650C Jackson Quek 4 U1147735C Joe Chan 5 U1827017C Emma Miller 6 U1496181C Aaron Lu 7 U1394862C Laura Ng 8 U1010259C Priyaa Singh 9 U1404268C That Mhu Khin 10 U1711164C Brandon Tiong 11 U1818089C Aurelio Jethro 12 U1300901C Elroy Ang 13 U1547881C Lian Ran 14 U1801344C Claudia 15 U1918893C Isabela Angus 16 U1816697C Lee Zhong Zin 17 U1144767C Lee Zong Zhin 18 U1763919C Lee Zoong Zin 19 U1920427C Lee Zhoong Zhin 20 U1932304C Lee Cong Zin 21 U1726435C Lee Chong Chin The added student's ID is: U1726435C </pre>
Adding an existing student:	<pre> Welcome to NTU Stars Planner! 1. Edit student access period 2. Add a student 3. Add/Update a course 4. Check available slot for an index number (vacancy in a class) 5. Print student list by index number 6. Print student list by course 7. Add student to course 8. Save your progress and exit 2 Current student list: 1 U1888199C Sarah Lim Malaysian F 2 U1362575C Hazel Wang PRC F 3 U1939650C Jackson Quek Singaporean M 4 U1147735C Joe Chan Singaporean M 5 U1827017C Emma Miller American F 6 U1496181C Aaron Lu Indonesian M 7 U1394862C Laura Ng Singaporean F 8 U1010259C Priyaa Singh Indian F 9 U1404268C That Mhu Khin Burmese F 10 U1711164C Brandon Tiong Singaporean M 11 U1818089C Aurelio Jethro Indonesian M 12 U1300901C Elroy Ang Singaporean M 13 U1547881C Lian Ran Singaporean F 14 U1801344C Claudia Singaporean F 15 U1918893C Isabela Angus Singaporean F 16 U1816697C Lee Zhong Zin French F 17 U1144767C Lee Zong Zhin British F 18 U1763919C Lee Zoong Zin Spanish F 19 U1920427C Lee Zhoong Zhin Bolivian F 20 U1932304C Lee Cong Zin Malaysian M Input new Student name: Lee Zhong Zin Student already exists! Please input a new student </pre>

Adding a student with invalid input:	<pre> Input new Student name: Lee Zhong Zin Student already exists! Please input a new student Input new Student name: Lee Chong Chin Input new Student school: HSS Input new Student gender (M/F): B Not valid entry! Insert either M or F </pre>
Adding a new course successfully:	<pre> Enter new course code: AB0502 Enter new course name: Managing Sustainability Enter new course school: NBS Enter new course Ais: 3 How many indices does this new course have? 4 How many lessons in each index? For Index 1 of Managing Sustainability, insert the lesson type for lesson number 1 (1 for lecture, 2 for tutorial, 3 for lab, 4 for seminar) 6 Wrong input! 4 For this lesson, enter the day (Monday is 1, Friday is 5) 1 For this lesson, enter the start period (0830 is 0, 2030 is 12) 6 For this lesson, enter the end period (0830 is 0, 2030 is 12) 6 For this lesson, enter the venue 200 Enter the index ID: MH250 What is the maximum number of students this new index has? 6 Updated course list: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology 6 AB0502 Managing Sustainability </pre>
Adding an existing course:	<pre> Welcome to NTU Stars Planner! 1. Edit student access period 2. Add a student 3. Add/Update a course 4. Check available slot for an index number (vacancy in a class) 5. Print student list by index number 6. Print student list by course 7. Add student to course 8. Save your progress and exit 3 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology 1. Add new course 2. Update existing course 3. Update existing course index 1 Enter new course code: MH2500 Course already exists! </pre>
Adding a course with invalid input:	<pre> Enter new course code: AB0502 Enter new course name: Managing Sustainability Enter new course school: NBS Enter new course Ais: 3 How many indices does this new course have? 1 How many lessons in each index? For Index 1 of Managing Sustainability, insert the lesson type for lesson number 1 (1 for lecture, 2 for tutorial, 3 for lab, 4 for seminar) 0 Wrong input! </pre>
Change course code, school, index, vacancies etc...	<pre> Choose which course to update 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology 6 AB0502 Managing Sustainability 6 Choose which index to update 1) Index ID: 739 Index Vacancy:9 Index Total Size:9 Index Waitlist Size:0 Seminar Monday 1430-1730 1 (1) Change the max number of students (2) Change the lessons1 The number of max students now is 9, what do you want to change it to?10 Successfully changed max students to 10Welcome to NTU Stars Planner! </pre>
Print student list by Course:	<pre> Choose course to be viewed: 1 Namelist of Index 71050 Namelist of Index 71051 1 U1801344C Claudia Singaporean F Namelist of Index 71052 Namelist of Index 71054 1 U1918893C Isabela Angus Singaporean F </pre>

Print student list by course but wrong course code input:

```
Choose course to view student namelist:
1 MH2500 Probability and Introduction to Statistics
2 CH1031 Basic Organic Chemistry with Laboratory
3 HC4050 Chinese Semantics
4 BF2209 Derivative Securities
5 ADP260 Theatre & Technology
Choose course to be viewed:
6
The course does not exist. Please enter a valid number from the option given above
```

Print student list by index number:

```
Choose course to view student namelist:
1

1) Index ID: 71050
Index Vacancy:20
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+27

2) Index ID: 71051
Index Vacancy:19
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+28

3) Index ID: 71052
Index Vacancy:20
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+31

4) Index ID: 71054
Index Vacancy:19
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+24
Choose index of course to view student namelist:
2
1 U1801344C Claudia Singaporean F
```

Print student list by index number but wrong index id input:

```
Index Waitlist Size:1

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+27

2) Index ID: 71051
Index Vacancy:0
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+28

3) Index ID: 71052
Index Vacancy:0
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+31

4) Index ID: 71054
Index Vacancy:20
Index Total Size:20
Index Waitlist Size:0

Lecture Friday 830-1030 online
Lecture Tuesday 930-1030 online
Tutorial Thursday 1130-1230 LHS-TR+24
Choose index of course to view student namelist:
5
The index does not exist. Please enter a valid number from the option given above
```

Edit Student Access period:	<pre> Current start login timing: Fri Nov 20 14:30:00 SGT 2020 Current end login timing: Mon Nov 30 11:30:00 SGT 2020 Enter new start login date (in format dd-mm-yyyy): 10-11-2020 Enter new start login time (in format hh:mm) 14:30 Enter new end login date (in format dd-mm-yyyy): 20-11-2020 Enter new end login time (in format hh:mm) 14:30 Successfully changed login timing period! 10 Nov 2020, 2:30:00 pm 20 Nov 2020, 2:30:00 pm </pre>
Check available index by course number:	<pre> Choose course to view vacancies: 1 MH2500 Probability and Introduction to Statistics 2 CM1031 Basic Organic Chemistry with Laboratory 3 HC4050 Chinese Semantics 4 BF2209 Derivative Securities 5 ADP260 Theatre & Technology 6 AB0502 Managing Sustainability 6 1) Index ID: 739 Index Vacancy:10 Index Total Size:10 Index Waitlist Size:0 ----- Seminar Monday 1430-1730 Choose index of course to view vacancies: 1 The number of vacancies for index 739 of course AB0502 is 10 </pre>