Gebze Technical University
Computer Engineering

CSE 222 - 2018 Spring

HOMEWORK 3 REPORT

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1 INTRODUCTION

1.1 Problem Definition

1.1.1 PART 1

We need to construct a structure to keep course data using LinkedList class. Also this structure will provide us abilities like getting certain courses (like same semester or course code) in same structure.

1.1.2 PART 2

We need to extend LinkedList class to create a List structure that can disable its items.

1.1.3 PART 3

We need to create a Linked List structure from scratch. It will only hold GTU Courses and it will be circular between semesters.

1.2 System Requirements

1.2.1 PART 1

The struct needs a course list as a csv file. And a GtuCseCourses object to work with. Class' default constructor will initialize itself by using specified course file. After that you can get specified lists by using getByCode, listSemesterCourses or getByRange methods.

1.2.2 PART 2

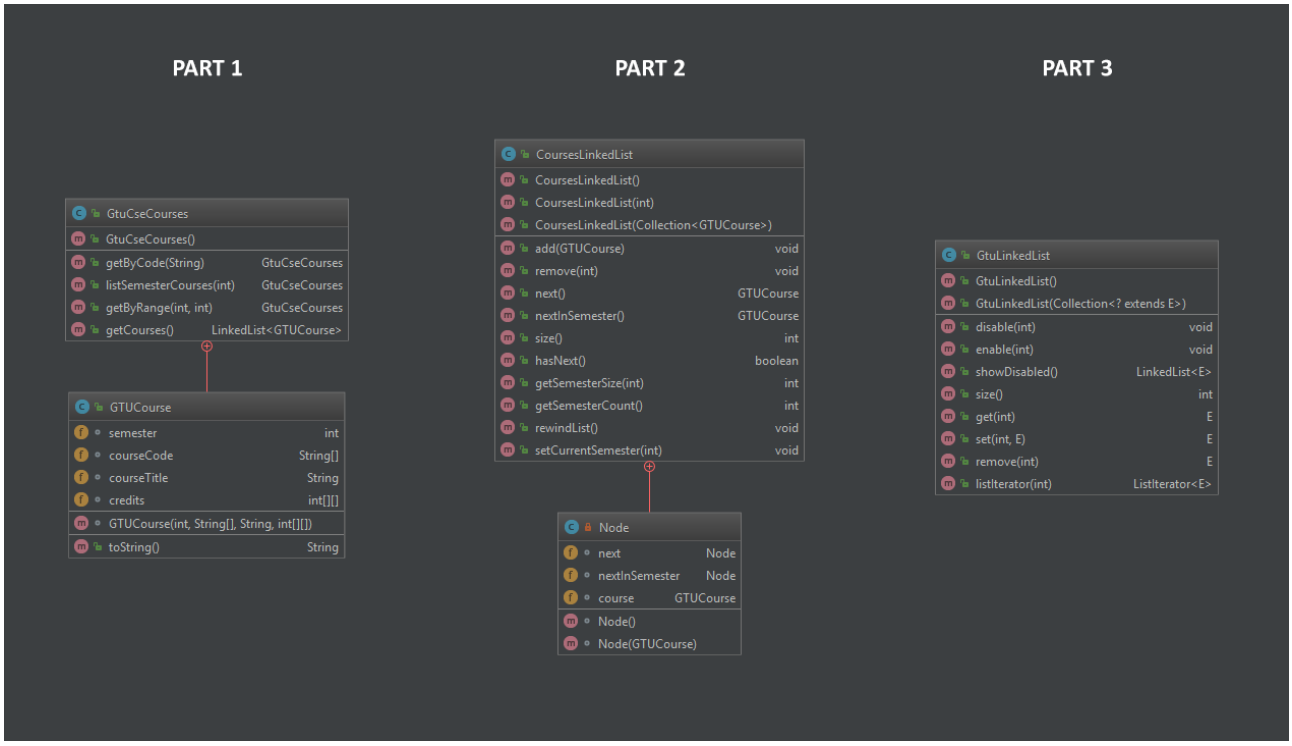
To disable items, we need to hold their information of disabled or not for every item. But since I can't change type of data, I used another list to keep index of disabled items. By disabling an item, class will add its index to the list. And to show disabled ones, showDisabled method will print disabled indexes and return a new List that contains only disabled items.

1.2.3 PART 3

To achieve a Linked List implementation, we need a Node type which will handle links and data keeping. And also we need to give how many semesters will List have, default is 8. After that you can use it like regular Linked List. But with semester wide circular structure and built in Iterator by rewindList, setCurrentSemester, next and nextInSemester methods.

2 METHOD

2.1 Class Diagrams



All parts are separate from each other but they use GtuCseCourses for data purposes as asked in assignment.

2.2 Use Case Diagrams

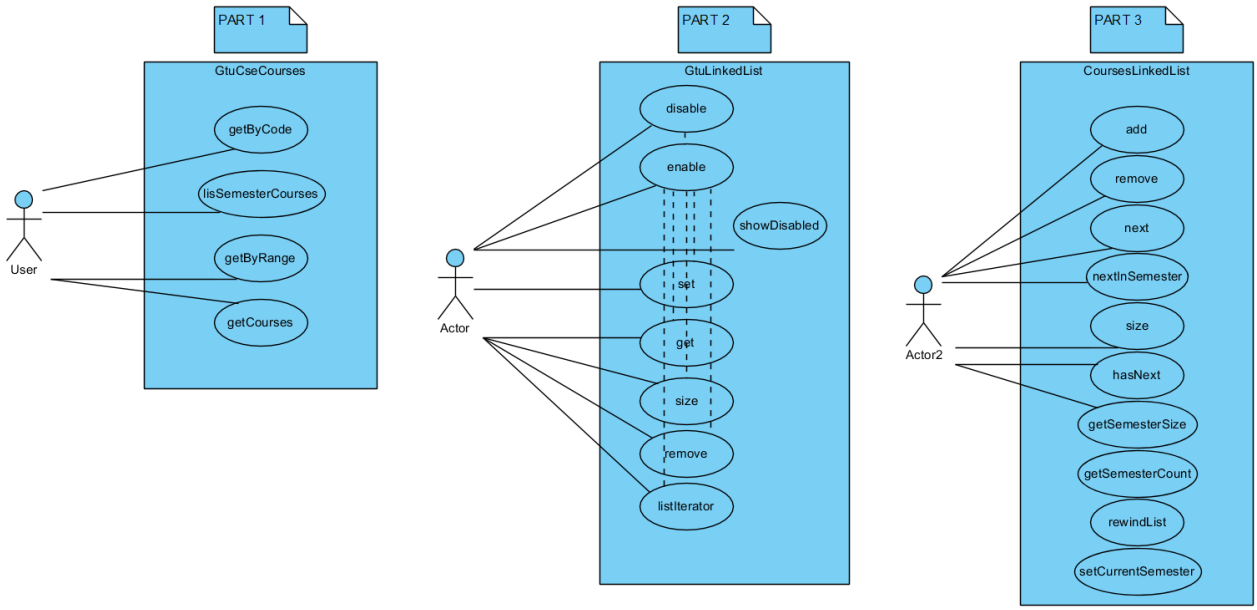


Diagram shows interactable user methods for use.

2.3 Other Diagrams

All diagrams can be found in Diagrams and Screenshot folder.

2.4 Problem Solution Approach

2.4.1 PART 1

To keep data of a course I wrote an inner GTUCourse class to represent a Course. Using this class, I created an instance of LinkedList class. And to get smaller portions of courses I used smaller linkedlists.

2.4.2 PART 2

While extending LinkedList, to create disable ability on the list I used another list for keeping disabled items indexes. So basically, I created another layer between LinkedList and GtuLinkedList.

Note: ListIterator method won't work for disabled items but it will iterate over them. To solve this issue, I need to implement another ListIterator class inside GtuLinkedList class. But could achieve a stable one.

2.4.3 PART 3

To create a simple Linked List implementation, I used a Node class to keep my data and link between them. Also, I linked the same semesters between them in a circular way by linking last item to the first. Also, this provides control over normal LinkedList methods. In example, if given index is disabled, you can't call LinkedList methods.

3 RESULT

3.1 Test Cases

Main method test case:

3.1.1 PART 1

- GtuCseCourses class instance constructs a new List from courses.csv
- Tries getByCode, listSemesterCourses, getByRange methods and assigns their return values to an array of GtuCseCourses respectively.
- Prints all values in the array.

3.1.2 PART 2

- Constructs a GtuLinkedList using GtuCseCourses class' LinkedList.
- Prints list size
- Disables first 10 course.
- Prints list size
- Enables back courses between index 2 and 7.
- Prints disabled items and assigns them to a new GtuLinkedList.

3.1.3 PART 3

- Constructs a CoursesLinkedList by using GtuCseCourses data.
- Prints list size
- Removes 4th item in the list.
- Prints list size
- Prints first 20 item using next() method.
- Prints all items using nextInSemester by grouping by semester.

Note: Unit tests of every part can be found in test folder and Javadoc.

3.2 Running Results

Part 1

```
Part 1 Tests:
    semester=1, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
    semester=2, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
    semester=3, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSB)', credits=3;2;2+0+0
    semester=4, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSB)', credits=3;2;2+0+0
    semester=5, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSA)', credits=3;2;2+0+0
    semester=6, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSA)', credits=3;0;2+0+0
    semester=7, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSB)', credits=3;2;2+0+0
    semester=8, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSB)', credits=3;2;2+0+0
    semester=8, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSA)', credits=3;2;2+0+0

    semester=2, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
    semester=2, courseCode=CSE 102, courseTitle='Computer Programming', credits=8;4;4+0+0
    semester=2, courseCode=CSE 108, courseTitle='Computer Programming Laboratory', credits=2;1;0+0+2
    semester=2, courseCode=MATH 102, courseTitle='Calculus II', credits=7;5;5+0+0
    semester=2, courseCode=PHYS 122, courseTitle='Physics II', credits=6;4;3+0+0
    semester=2, courseCode=PHYS 152, courseTitle='Physics Laboratory II', credits=1;1;0+0+2
    semester=2, courseCode=SSTR 102, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution II', credits=2;2;2+0+0
    semester=2, courseCode=TUR 102, courseTitle='Turkish II', credits=2;2;2+0+0

    semester=2, courseCode=PHYS 122, courseTitle='Physics II', credits=6;4;3+0+0
    semester=2, courseCode=PHYS 152, courseTitle='Physics Laboratory II', credits=1;1;0+0+2
    semester=2, courseCode=SSTR 102, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution II', credits=2;2;2+0+0
    semester=2, courseCode=TUR 102, courseTitle='Turkish II', credits=2;2;2+0+0
    semester=3, courseCode=CSE 241, courseTitle='Object Oriented Programming', credits=9;5;3+2+0
```

Part 2

```
Part 2 Tests:
List size before disabling = 54
List size after disabling = 48
List after disable/enable:
Element Disabled. Can't proceed. - Index at 0
Element Disabled. Can't proceed. - Index at 1
Element Disabled. Can't proceed. - Index at 2
    semester=1, courseCode=MATH 101, courseTitle='Calculus I', credits=7;5;5+0+0
    semester=1, courseCode=PHYS 121, courseTitle='Physics I', credits=6;4;3+0+0
    semester=1, courseCode=PHYS 151, courseTitle='Physics Laboratory I', credits=1;1;0+0+2
    semester=1, courseCode=SSTR 101, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution I', credits=2;2;2+0+0
Element Disabled. Can't proceed. - Index at 7
Element Disabled. Can't proceed. - Index at 8
Element Disabled. Can't proceed. - Index at 9
    semester=2, courseCode=CSE 108, courseTitle='Computer Programming Laboratory', credits=2;1;0+0+2
    semester=2, courseCode=MATH 102, courseTitle='Calculus II', credits=7;5;5+0+0
    semester=2, courseCode=PHYS 122, courseTitle='Physics II', credits=6;4;3+0+0
    semester=2, courseCode=PHYS 152, courseTitle='Physics Laboratory II', credits=1;1;0+0+2
    semester=2, courseCode=SSTR 102, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution II', credits=2;2;2+0+0
    semester=2, courseCode=TUR 102, courseTitle='Turkish II', credits=2;2;2+0+0
    semester=3, courseCode=CSE 241, courseTitle='Object Oriented Programming', credits=9;5;3+2+0
    semester=3, courseCode=CSE 211, courseTitle='Discrete Mathematics', credits=6;3;3+0+0
    semester=3, courseCode=CSE 231, courseTitle='Circuits And Electronics', credits=8;4;4+0+0
    semester=3, courseCode=CSE 233, courseTitle='Circuits And Electronics Laboratory', credits=2;1;0+0+2
Disabled items:
semester=1, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
semester=1, courseCode=CSE 101, courseTitle='Introduction To Computer Engineering', credits=8;3;3+0+0
semester=1, courseCode=CSE 107, courseTitle='Introduction To Computer Science Laboratory', credits=2;1;0+0+2
semester=1, courseCode=TUR 101, courseTitle='Turkish I', credits=2;2;2+0+0
semester=2, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
semester=2, courseCode=CSE 102, courseTitle='Computer Programming', credits=8;4;4+0+0
```

Part 3

```
Part 3 Tests:
List size before removal = 54
List size after removal = 53
Printing list using next:
    semester=1, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
    semester=1, courseCode=CSE 101, courseTitle='Introduction To Computer Engineering', credits=8;3;3+0+0
    semester=1, courseCode=CSE 107, courseTitle='Introduction To Computer Science Laboratory', credits=2;1;0+0+2
    semester=1, courseCode=PHYS 121, courseTitle='Physics I', credits=6;4;3+0+0
    semester=1, courseCode=PHYS 151, courseTitle='Physics Laboratory I', credits=1;1;0+0+2
    semester=1, courseCode=SSTR 101, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution I', credits=2;2;2+0+0
    semester=1, courseCode=TUR 101, courseTitle='Turkish I', credits=2;2;2+0+0
    semester=2, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
    semester=2, courseCode=CSE 102, courseTitle='Computer Programming', credits=8;4;4+0+0
    semester=2, courseCode=CSE 108, courseTitle='Computer Programming Laboratory', credits=2;1;0+0+2
    semester=2, courseCode=MATH 102, courseTitle='Calculus II', credits=7;5;5+0+0
    semester=2, courseCode=PHYS 122, courseTitle='Physics II', credits=6;4;3+0+0
    semester=2, courseCode=PHYS 152, courseTitle='Physics Laboratory II', credits=1;1;0+0+2
    semester=2, courseCode=SSTR 102, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution II', credits=2;2;2+0+0
    semester=2, courseCode=TUR 102, courseTitle='Turkish II', credits=2;2;2+0+0
    semester=3, courseCode=CSE 241, courseTitle='Object Oriented Programming', credits=9;5;3+2+0
    semester=3, courseCode=CSE 211, courseTitle='Discrete Mathematics', credits=6;3;3+0+0
    semester=3, courseCode=CSE 231, courseTitle='Circuits And Electronics', credits=8;4;4+0+0
    semester=3, courseCode=CSE 233, courseTitle='Circuits And Electronics Laboratory', credits=2;1;0+0+2
    semester=3, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSB)', credits=3;2;2+0+0
Printing list using nextInSemester:
    Printing semester 1:
        semester=1, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
        semester=1, courseCode=CSE 107, courseTitle='Introduction To Computer Science Laboratory', credits=2;1;0+0+2
        semester=1, courseCode=MATH 101, courseTitle='Calculus I', credits=7;5;5+0+0
        semester=1, courseCode=PHYS 121, courseTitle='Physics I', credits=6;4;3+0+0
        semester=1, courseCode=PHYS 151, courseTitle='Physics Laboratory I', credits=1;1;0+0+2
        semester=1, courseCode=SSTR 101, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution I', credits=2;2;2+0+0
        semester=1, courseCode=TUR 101, courseTitle='Turkish I', credits=2;2;2+0+0
    Printing semester 2:
        semester=2, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSC)', credits=2;1;2+0+0
        semester=2, courseCode=CSE 102, courseTitle='Computer Programming', credits=8;4;4+0+0
        semester=2, courseCode=CSE 108, courseTitle='Computer Programming Laboratory', credits=2;1;0+0+2
        semester=2, courseCode=MATH 102, courseTitle='Calculus II', credits=7;5;5+0+0
        semester=2, courseCode=PHYS 122, courseTitle='Physics II', credits=6;4;3+0+0
        semester=2, courseCode=PHYS 152, courseTitle='Physics Laboratory II', credits=1;1;0+0+2
        semester=2, courseCode=SSTR 102, courseTitle='Principles Of Atatürk And The History Of Turkish Revolution II', credits=2;2;2+0+0
        semester=2, courseCode=TUR 102, courseTitle='Turkish II', credits=2;2;2+0+0
    Printing semester 3:
        semester=3, courseCode=CSE 241, courseTitle='Object Oriented Programming', credits=9;5;3+2+0
        semester=3, courseCode=CSE 211, courseTitle='Discrete Mathematics', credits=6;3;3+0+0
        semester=3, courseCode=CSE 231, courseTitle='Circuits And Electronics', credits=8;4;4+0+0
        semester=3, courseCode=CSE 233, courseTitle='Circuits And Electronics Laboratory', credits=2;1;0+0+2
        semester=3, courseCode=XXX XXX, courseTitle='Teknik Olmayan Seçmeli (SSB)', credits=3;2;2+0+0
        semester=3, courseCode=EN 111, courseTitle='English For Business Life', credits=2;2;2+0+0
```

NOTE: All images, diagrams can be found under Screenshots and Diagrams folder.

3.3 Time Complexity

Suppose n = number of courses;

3.3.1 PART 1

Constructor = T(n) = O(n)
getByCode = T(n) = O(n)
listSemesterCourses = T(n) = O(n)
getByRange(k) = T(k) = O(k)

3.3.2 PART 2

Constructor() = T(n) = O(1)
Disable = T(n) = O(1)
Enable = T(n) = O(1)
showDisabled = T(n) = O(n)

3.3.3 PART 3

Constructor(k) = T(k) = O(k)
Add = T(n) = O(1)
Remove(k) = T(k) = O(k)
next = T(n) = O(1)
nextInSemester = T(n) = O(1)
size = T(n) = O(1)