CSC111 Lab
Arrays – Lab III Array Of Objects
---- Lab 11 ---

Call your project **Lab11.**

In this Lab, we will create 3 classes. **Student**, **courseManager** and **testCourseManager**.

The class **student** is a representation of a student, it contains id, name and score of the student. The class **courseManager** contains an array named **students** of student objects. Each element of that array is a student object that has an id, name and score. The class has methods that allows the user to add a student to the array, remove a student, find a student by name, display student data and other methods. Here is the UML diagrams for the three classes:

```
testCourseManager
+ main()
```

```
                        Student
-id: int
-name: String
-score: double
Student ()
Student (id:int, name:String, score:double)
+setId(id:int):void
+setName(name:String):void
+setScore(score:double):void
+getId():int
+getName():String
+getScore():double
```

```
                     courseManager
-students[]: Student
-nStudents: int
+MAX SIZE: int
courseManager()
+getNStudents():int
+addStudent(newStudent: Student): void
+addStudent2(newStudent: Student): void
+dispalyStudent(i: int): void
+findStudentByName(name: String) : int
+ findStudentById(id: int) : int
+findMaxScoreIndex() : int
+computeAverageScore(): double
+removeStudent(index: int) :void
+removeAndShiftStudents(index: int) :void
```

Student

As shown in the UML diagram, class Student has the attributes: **id**, **name** and **score**. It also has two constructors, three setters and three getters.

Data Members:

- **id**: int
- **name**: String
- **score**: double

Methods:

- **Student** ()
- **Student** (id:int, name:String, score, double)
- **setId** (id:int)
- **setName** (name:String)
- **setScore** (score:double)
- **getId**():int
- **getName**():String
- **getScore**():double

courseManager

Data Members:

- **students**[]: Student - An array of Student. Each element is an object of the class Student.
- **nStudents**: int **-** The current number of students in the array students.
- **MAX_SIZE**: int - The maximum number of students, or size of the array *students*. (set it to 100).

Methods:

- **courseManager**(): a constructor that sets nStudents to zero and initialize the array *students* with size MAX_SIZE.
- **getNStudents**():int returns the current number of students in the array.
- **addStudent** (newStudent: Student):void - Adds the student with the given students' object to the array. If course is full, it prints the error message: "ERROR: COURSE IS FULL".
- **addStudent2**(newStudent: Student) : Adds the student with the given students' object to the list. If course is full, it prints the error message: "ERROR: COURSE IS FULL". If student is already added it prints the error message: "ERROR: STUDENT ALREADY ADDED".
- **displayStudent** (i:int):void - Displays all data of the student at index i.

- **findStudentByName** (name: String) : int - Returns the array index of the student by searching for a specific student name. If student name is not found, -1 is returned.
- **findStudentById** (id: int) : int - Returns the array index of the student by searching for a specific student id. If student id is not found, method will return -1.
- **findMaxScoreIndex** (): int - Returns the index of a student whose score is the highest in the class.
- **computeAverageScore** (): double - Returns the average score of all students.
- **removeStudent** (index: int) :void - Removes student at the given index and set its value to the student at the end of the array. .
- **removeAndShiftStudents** (index: int) : void – Removes a student and shifts all remaining students after index back one element to cover for the deleted student.

testCourseManager

In The main method in class testCourseManager you must do the following:

- Create a courseManager Object **cm**.
- Ask the user to enter the number of students.
- Read the students information and add them to the array **students**.
- Display all students in the class.
- Display the average score of all students in the class
- Display the student name with the max score.
- Remove one of the students.
- Display all students in the class.