CSE108 – Computer Programming Lab.

Lab 10

Struct and Recursion

16/05/2025

You are going to implement a simple grading system for a class of students. First, you must define two structs: One for a single student. This struct should include name (string), surname (string), id (integer), midterm grade (integer), final grade (integer), average grade (double), letter grade ('P' for pass or 'F' for fail). Another struct should represent the class. It must include: an array of student structs (max 100 students), the number of students in the class, the threshold (double) average grade required to pass the class.

Part 1. (40 pts) You will write a function that creates and fills a class struct. The function should ask first for the threshold average grade to pass the class (e.g., 60.0). Then, For each student, get their name, surname, ID, midterm and final grades. After receiving the grades, immediately calculate the average grade and letter grade of the student (see Part2). Store all this data in the class struct and return it.

Part 2. (15 pts) You have to implement a function that takes a Student struct **by reference** and also takes the class threshold value as input. The function should calculate the average as:

average = (midterm * 0.4 + final * 0.6)

If the average is greater than or equal to the threshold, the letter grade should be set to 'P' (pass), otherwise 'F' (fail). This function should be called **immediately after** each student's data is entered in the initialization step.

Part 3. (20 pts) Write a function that takes the class as input and sorts the student array **in descending order** based on their average grade.

Part 4. (15 pts) Write a function that takes a student ID, a new final grade, and the class as input. It should search for the student with the given ID and update the student's final grade with the new value. After updating the value, the function recalculate their average and letter grade by calling the calculation function (part 2). If the student is not found, print an error message.

Part 5. (10 pts) You must implement a function that prints the full information of the class in a table format. It should display each field of every student, including name, surname, ID, midterm, final, average, and letter grade. At the end of the table, you should also print the number of students who passed the class (i.e., those with letter grade 'P') and the overall class average of the average grades.

Example Input / Output:

```
Enter threshold average to pass: 60

Student 1
Enter name: Alice
Enter surname: Smith
Enter ID: 101
Enter midterm grade: 70
Enter final grade: 80
Student 2
Enter name: Bob
Enter surname: Jones
Enter ID: 102
Enter midterm grade: 50
Enter final grade: 55
Student 3
Enter name: Clara
Enter surname: Lee
Enter ID: 103
Enter midterm grade: 65
Enter final grade: 75

Class Information:
------------------------------------------------------------
Name     Surname     ID    Midterm  Final  Average  Grade
------------------------------------------------------------
Alice    Smith       101     70       80     76.0      P
Bob      Jones       102     50       55     53.0      F
Clara    Lee         103     65       75     71.0      P
------------------------------------------------------------
Passing students: 2
Class average: 66.7

#call sorting function
Class Information:
------------------------------------------------------------
Name     Surname     ID    Midterm  Final  Average  Grade
------------------------------------------------------------
Alice    Smith       101     70       80     76.0      P
Clara    Lee         103     65       75     71.0      P
Bob      Jones       102     50       55     53.0      F
------------------------------------------------------------
Passing students: 2
Class average: 66.7

Update final grade:
Enter ID: 102
Enter new final grade: 75

Class Information:
------------------------------------------------------------
Name     Surname     ID    Midterm  Final  Average  Grade
------------------------------------------------------------
Alice    Smith       101     70       80     76.0      P
Clara    Lee         103     65       75     71.0      P
Bob      Jones       102     50       75     63.0      P
------------------------------------------------------------
Passing students: 3
Class average: 70.0
```