Students' Personal and Academic Records

A university keeps and maintains the records of its students in three types of text files. Details of these files are as follows:

personal.txt: This file stores the personal information of all the students (including students who have passed out). The information stored in the file includes student's *Batch, roll number, Name, Gender, National ID Card number, Father's Name, Date of Birth, Address, City, Cell Phone number, Father's status* (A for Alive and 'D' for Dead) and *Earlier Education*. Note that all these fields are separated by commas. e.g.,

Batch	Roll no	Gender	Name	NID Card #	Father's name	Date of Birth	Address	City	Cell Phone #	Father	Education
2020	20L4358	M	Hassan Kamal	35200-0533394-1	Kamal Nasir	1-8-2001	142-H Model Town	Lahore	0321-0531109	A	A levels
2018	18L3020	M	Anwar Khan	33200-2083973-2	Walayat Khan	18-5-1999	3 Satellite Town	Sargodha	0333-1139395	D	F.Sc
2021	21L4938	F	Saima Anjum	35440-0244931-1	Anjum Hassan	23-12-2003	442-C Faisal Town	Lahore	0307-9385531	A	A levels
….	……	..	……...	…….	…….	…….	…….	…….	……...	…..	…….

Sample Data in the personal.txt file

courses.txt: This file stores the information regarding all the courses being taught in the university. The course information stored in the file includes *Course Code, Title, Credit Hours* and *Remarks*. e.g.,

Course Code	Title	Credit Hours
EE-346	Digital Signal Processing	4
CS-101	Programming Fundamentals	4
MT-117	Applied Calculus	3
……	……..	…….

Sample Data in the courses.txt file

results.txt: The third file stores the information regarding the results of the students in different courses. The file contains '*n*' records and each single record in the file stores *Student's Roll No, Course Code,* the *Semester* in which the student studied that course and the *Marks* the student obtained in that course. e.g.,

Sample Data in the results.txt file

Roll Number	Course Code	Semester	Marks
18L4302	CS-421	7	83
19L4593	CS-417	5	76
…….	…….	……	…..

The university has only two semesters in its one academic year.

The university requires a system that can generate reports from students, courses and results records. The system would read data from these three types of files and generate different types of reports on user's demand. The reports that the system is required to generate are described as follows:

Report 1a – Personal Record of a student
The user of the system enters the Roll No. of a student and the system shows all the personal information of that specific student in a nice format.

Report 1b – Personal Information of all the students in Sorted Order
The user may need to save the personal information of all the students in a file in sorted order. Sorting may be done on any field as desired by the user. e.g., the user may be interested to sort in ascending order by students' names or roll numbers etc.

Report 1c –Personal Information of group of students
The user of the system may require some particular information of a group of students (e.g., names and roll numbers of all the students who belong to Lahore OR roll numbers of all the female students who belong to 2020 batch OR names and batch of all the students whose fathers are not alive OR names of students of a particular batch who have done FSc from Lahore etc.). If the user gives the option to save the output in a file, the program should ask the user about the name of the file and accordingly create a file with that name.

Report 1d – Student's Personal Information
The user may need to see the ages of some group of students (in sorted order) on the day when the program is run. The program should display exact age in *years*, *months* and *days*. The program expects the user to enter the roll number only. (note that age will be computed by your program based on the date of birth and current date).

Report 2 – Course Results (a)
The user of the system enters the *Course Code* and *the Semester* in which the course was offered. The system shows a list of all those students who studied that course in the given semester. The format of the report is given below:

Course Code: MT-117				Credit Hours: 3	
Course Title: Applied Calculus				Semester: Fall 2020	
Sr. No.	Roll No.	Student Name	Marks	Grade	GPA
1	18-4001	Junaid Khan	67	B-	2.67
2	19-4337	Farhan Ahmad	84	A	4.00
…	…	…	…	…	…
38	20-4993	Baber Nisar	54	D+	1.33
		Maximum Marks	93		
		Minimum Marks	32		
		Average Marks	57.92		
		Standard Deviation	11.51		
		Average GPA of the class			2.57
Maximum marks obtained by Amir Shah (20-4883)					

Assume that the grading is absolute and assigned according to the following mapping:

Marks Range	Grade	GPA
>=90	A+	4.00
>= 86 but less than 90	A	4.00
>=82 but less than 86	A-	3.67
>=78 but less than 82	B+	3.33
>=74 but less than 78	B	3.00
>=70 but less than 74	B-	2.67
>=66 but less than 70	C+	2.33
>=62 but less than 66	C	2.00
>=58 but less than 62	C-	1.67
>=54 but less than 58	D+	1.33
>=50 but less than 54	D	1.00
< 50	F	0.00

Report 3 – Course Results (b)
The user of the system enters a *Course Title*, the *Semester* in which the course was offered and a grade *Point limit*. The system shows a list of all those students who have studied the course in the given semester and had grade *Point* greater than the given grade *Point limit*. The format of the report is the same as given above.

Report 4 – Student's Transcript
The user of the system enters the Roll No. of a student and the system shows the semester-wise transcript or marks sheet of the student in the following format:

Example of a transcript

Student's Name: Hassan Akbar		Roll No.: 20-4897			
Transcript printed on December 10, 2021		Current Age: 19 years 6 months 14 days			
Father's Name: Akbar Ali		Batch: 2020			
	Fall 2020				
Code	**Course Title**	**Credit Hrs.**	**Marks**	**Grade**	**GPA**
CS-0102	Islamic Studies	3	64	C+	2.33
…	…….	……	….	…….	……
Total Credit Hours:		SGPA: …….			
		CGPA: …….			
	Spring 2021				
Code	**Course Title**	**Credit Hrs.**	**Marks**	**Grade**	**GPA**
SS-0201	English	4	73	B-	2.67
…					
Total Credit Hours:		SGPA:			
		CGPA:			
…					

Project Deliverables and Schedule:

Start of Project: December 11, 2021 (Saturday)
Design Document: December 17, 2021 (Friday)
End of Project:
(Project Code and executable submissions)
December 30, 2021 (Thursday)

Project Evaluations: December 30 and December 31, 2021 (Friday, Saturday)

What is to be submitted in Design Document?

1. All the structures you will be using in your program with its data members details. e.g., the struct for using Semester.

```
struct Semester        //will hold the complete semester name
{
      char sem[7];     //Fall or Spring (one extra space for '\0')
      int year;        //2010 or 2011 etc.
};
```

(note that this is just an example as you will have many similar structs)

2. The function names and their interfaces diagrammatically.

3. Function prototypes e.g., to read courses.txt file, you may have a function prototype as follows:

```
void ReadResultsFile (ifstream& file,          /* to read a file */
                      char courseCode[][8],    /* codes of courses */
                      char courseName[][30],   /* name of course */
                      int crHrs[]);            /* credit hours  */
```

/*this function will read courses.txt file. We have assumed that there can't be more than 7 characters in the course code e.g., EE-0117 (8th character is for NULL character) and maximum 30 characters in the course name. */

Here I am assuming that you are using 2-D arrays for the course codes as well as for course names. You will see that to pass 2-D arrays to a function, we must give (as a constant within `[]` brackets) the 2nd dimension (i.e., the number of columns).

Similarly the prototypes of all the functions (you will be using) are to be written.