BIRZEIT UNIVERSITY

Department of Computer Science

COMP2421 - Data Structures and Algorithms (Spring 2023/2024)

Project#4 Due Date: June 10th, 2024 (by 10:00 PM)

In this project, you need to implement a Course Prerequisite Planner and Campus Route Finder application in C programming language, with the following tasks:

1. Implement the required code to assist the 1st year students to find the shortest path between specific buildings using **Dijkstra** algorithm by reading the required information from the input_buildings.txt file, the file must initially have the information in the table below, but you can add more buildings and their distances in the file.

→ direction	Masri	Aggad	A.Shaheen	Bamieh	AL.Juraysi	Alsadik	KNH	Sh.Shaheen
Masri			70	39			155	78
Aggad					71	52	43	
A.Shaheen		60			89			40
Bamieh		139					77	33
AL.Juraysi								
Alsadik					57			
KNH					67			
Sh.Shaheen		90			120	140	104	

input_buildings.txt: contains for example contains some buildings, but you can add more buildings.

```
Masri#A.Shaheen#70
A.Shaheen#Aggad#60
```

* You must fill in the file with all distances between buildings.

Then you can use either contingency matrix or contingency list to represent the graph and store it in your program. The user inserts two buildings, then the application will find the shortest route between them, prints the total distance and the route between the two buildings.

2. Implement the required code to assist the 1st year students in computer engineering to sort the courses they must take using **topological sort.** The application must load the courses from the input_courses.txt file, where this file will contain the courses listed in the table below:

Course	**Prerequisites**
COMP2310	COMP133
COMP2421	COMP133
COMP333	COMP2421
COMP433	COMP333
ENCS2340	COMP133
ENCS2380	ENCS2340
ENCS3130	COMP133
ENCS3310	ENCS2380
ENCS3340	COMP233 and COMP133
ENCS4320	COMP233 and COMP133

input_courses.txt: contains the list of courses and their pre-requisite, below is an example.

```
COMP2310# COMP133
ENCS3340# COMP233# COMP133
```

* You have to fill in the file with all courses and their pre-requisites .

Upon request, the application sorts the courses using topological sort and saves them internally in the program. So, the user can print them on request.

Your application must have the following menu:

1. Load the two files.
2. Calculate the shortest distance between two buildings.
3. Print the shortest route between two buildings and the total distance.
4. Sort the courses using the topological sort.
5. Print the sorted courses.
6. Exit the application.

The deadline for this assignment will be June 10th, 2024 (by 10:00 PM). LATE SUBMISSIONS will not be accepted for any reason. Before the discussion, please ensure your application runs properly on your laptop. Project discussions will be decided later.

Grading policy:

1. Your application should have all functionalities working properly.
2. Your application should contain a menu to allow the user to select which option (s) he would like to run.
3. Properly handling files, I/O errors, invalid user inputs, and edge cases in text editing operations.
4. The files' names must be as mentioned above.
5. Do not use functions or techniques you did not have before in the university courses.

Notes and submission instructions:

1. **This is individual work**. It should represent your efforts. It is fine to discuss your work and ask your colleagues, but you are not allowed to copy/paste part of the work of others or give it to anyone else. You are not allowed to post/copy from other websites and/or social media, which will be considered cheating.
2. Any **plagiarized** code will not be marked, resulting in a **zero** grade.
3. You are responsible for the submitted code.
4. **Document format**. Please submit only the code file (**c** file) containing your project's code. Please rename it as follows: "**P4_YourStudentID_FirstNameLastName_SectionNo.c**".
5. Include your full name, student ID, and section number at the beginning of your file.
6. Please do not compress the file; only the C-file is needed.

Good luck!