

CS 202, Summer 2012

Homework Assignment 5

Due: 23:59, July 31, 2012

In this programming assignment, you will be creating the curriculum for Bilkent University Department of Computer Engineering. You will be given a total of 47 courses and will be asked to distribute them into 8 semesters. CS department has already decided on the content, prerequisites and credits of each course. Therefore, you will only need to come up with a program that does not conflict with the prerequisite constraints. For example, a student is not allowed to take CS202 before he/she takes CS201, so you cannot put CS201 and CS202 in the same semester.

In this assignment you will be given an input file `courses.txt` that contains all the necessary information on the courses. The first line in the file represents the number of courses which is 47. The rest of the lines include the course code, unique course id, credits, number of prerequisites and the ids of the prerequisites. For example, the id of `cs342` is 3 and it is worth 4 credits, has 2 prerequisites whose ids are 4 and 5. This means that you have to take `cs202` and `cs224` before you can take `cs342`.

A sample input and output file are provided below. Keep in mind that there may be more than one correct answer to this problem. The format of the `output.txt` contains the number of semesters at the first line. Afterwards, each line contains semester id, number of courses per semester, and course ids. For example, in this sample solution, there are 8 semesters. In the 1st semester, there are 5 required courses whose ids are 1,8, 18, 15 and 12.

courses.txt

```
47
cs101      1      4      0
cs102      2      4      1      1
cs342      3      4      2      4      5
cs202      4      3      1      6
cs224      5      3      1      7
cs201      6      3      1      2
cs223      7      4      0
math101    8      4      0
.
.
.
```

output.txt

```
8
1 5 1 8 10 15 12
2 6 2 9 11 24 16 21
3 6 13 14 6 7 24 23
4 6 22 4 5 17 18 19
5 7 25 27 29 31 33 35 34
6 5 3 26 28 30 36
7 6 40 41 42 43 37 38 39
8 5 46 47 44 45 20
```

Rules:

1. You can assign up to 20 credits per semester.
2. If you assign a course `c` to a semester `s`, you have to make sure that all the prerequisites of `c` have been assigned to earlier semesters.
3. There should be at least 3 and at most 8 courses per semester.
4. Ideally, there should be a total of 8 semesters. However, a minimum of 7 semesters and a maximum of 9 semesters are allowed. If your solution requires less than 7 or more than 9 semesters, you will be penalized by 5 points for each lacking/excessive semester. You will not lose more than 20 points for this constraint.

Hint: Take a look at the topological sort algorithm.

The name of the input file, the query file, and the output file will be provided as command line arguments to your program. Thus, we call your programs using three command line arguments in the following format:

```
user@dijkstra:~>./schedule <inputFile> <outputFile>
```

Notes:

1. This assignment is due by 23:59 on Tuesday, July 31st, 2012. You should upload your homework to the upload page (<http://www.cs.bilkent.edu.tr/~ogur/cs202/hw5.html>) before the deadline. No hardcopy submission is needed. The standard rules about late homework submissions apply. Please see the course syllabus for further discussion of the late homework policy as well as academic integrity.
2. Your code must not have any memory leaks. You will lose points if you have memory leaks in your program even though the outputs of the operations are correct.
3. You should upload all files as a single zip file.
4. You are free to write your programs in any environment (you may use either Linux or Windows). However, we will test your programs on “dijkstra.ug.bcc.bilkent.edu.tr” and we will expect your programs to compile and run on the “dijkstra” machine. If we could not get your program properly work on the “dijkstra” machine, you would lose a considerable amount of points. Thus, we recommend you to make sure that your program compiles and properly works on “dijkstra.ug.bcc.bilkent.edu.tr” before submitting your assignment.