

Robert Owens (rao7utn)
Scheduling (Basic HW: Network Flow)

This problem requires to make sure that each student can enroll in n courses given that course capacities are restricted.

My approach to solving this problem is as follows:

By setting up a valid Network Flow graph, the answer to a given problem can be solved by running Ford-Fulkerson on the network flow graph. The network flow graph can be modeled as a digraph with Students on the left and Courses on the right. The source feeds into each student and has a lower bound and capacity of n , since each student must be enrolled in n courses. Then each course request can be modeled as a network flow edge with capacity 1 from the student that requested the given course to the course that the student requested. Finally, each course can have a network flow edge from the course to the sink with a capacity equivalent to the limit on the class size. Since the flow network is properly established, simply run Ford-Fulkerson on the flow-network and if it is found that the maximum possible flow through the network is greater than or equal to the number of students times the number of classes each student should be enrolled in then it is possible to satisfy the constraints of the problem so print yes, otherwise print no.

This algorithm runs in $\theta(f * M)$ time, where f is the maximum flow and M is the number of flow network edges. This is because my solution to this problem is simply an implementation of the Ford-Fulkerson algorithm.

The grader may look at the files of code uploaded with this submission and thus no pseudocode is required here.