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# Exam Scheduling Conflict Optimization

**Ali Almaslami, Mohammad Alsaad and Abdullah Alqarne**
Industrial Engineering Department
KFUPM, KSA
s201847020@kfupm.edu.sa, s201845540@kfupm.edu.sa,
s201816960@kfupm.edu.sa

## Abstract

This study presents a heuristic approach to resolve an actual scheduling problem, for an exam at the King Fahd University of Petroleum and Minerals in Saudi Arabia. To assess the timeliness, we use a new objective function. In order to prevent students from taking successive tests on the same day, the goal function prioritizes timeslots above days when assigning exams to timeslots. Additionally, the goal is to space out tests over the course of the testing session. This heuristic may be applied to other real-world challenges. Results of computation are presented. All institutes of higher education deal with the scheduling of final exams on a regular, and difficult basis. The ability to create the timetable as early in the semester as feasible while maintaining the maximum flexibility is ideal for all parties concerned. Students like to be able to plan their trip towards the end of the semester ahead of time to benefit from deals on tickets, etc. (In this essay, the term ”semester” shall be used to refer to the academic year. While the systems employed by different institutions—such as quarter, summer, trimester, etc.—vary, all are conceptually tied to the idea of a semester.) Additionally, faculty like to plan as early as feasible for both the test period and any intersession breaks between periods of teaching. Finally, administrators like to complete the procedure as quickly as feasible. The best time to make the final exam schedule available is during registration but doing so necessitates knowing which courses will have final exams at that time. Even if it could be conceivable at some universities. The choice to provide a final exam in any specific course is based on a variety of variables. The first is that instructors are not compelled to provide final examinations, and some courses are presented in a way that does not need them. Instead of a final test, some courses substitute a term paper, project, or seminar format for the class. It is up to the departments and teachers to manage this. Finally, not all classes that were initially planned to meet during pre- registration period do so in any given semester, and not all teachers are known until the semester has started. This is particularly true for the fall semester because pre-registration happens in the late spring when fall hiring choices are still being made. In this paper, we discuss how we approached and overcame the scheduling issue for Semester (221), Year 2022, at King Fahd University of Petroleum and Minerals (KFUPM). The datasets, which comprise 598 courses, 10242 students, 30 periods, and 10 exam days, have been preprocessed based on the given data. The package comprises of a collection of heuristic techniques created to address the different stages of the issue. The pre-intervention scenario is presented first, followed by the system’s aims, the solution method, and the reasons behind the solutions selected to address the issue. The programming strategy and report generation are described in the end.

In the past schedules, the registrar service at KFUPM focuses on making a schedule that has no conflict and that no student has three exams in the same day, with out considering an objective, the registrar only focuses on satisfying the con- strains. This method will be fine regarding having no conflicts for any student, but it doesn’t take into account creating a schedule to enhance students performance and increasing the distance between exams. The problem we are trying to solve is not only establishing a schedule without conflicts for any student, but also we are looking to create a better schedule for the students that has suitable distribution for the courses to enhance students performance in their exams and making it easier to study. This will be done by making a well-established formulation in terms of objective function and function. In the objective function, we will aim to minimize conditions where the student have three or four exams in two consecutive days, and where the student have two exams in a raw, and where the student have two exams in three consecutive slots. To explain the slots, the aim is to establish the schedule in ten days and each day has three slots morning, afternoon, evening. As a result, we will have thirty slots in total.

Using the steps provided before we divide the students into groups, solve the sub problems taking into consideration the common courses between them, and combine the solutions for all groups to come up with the final exam schedule for all courses. the main difference between the solution we got and the original final exams schedule is the number

of exams days, we were able to get a feasible solution considering only 10 days, while the original final exam schedule provided by the university registrar considers exams on Saturday in addition to the 10 days (11 days in total). In addition, there is no conflict between any exam for all students, all the constrains were satisfied, and the exams for any student were separated as much as possible to give them more time to study. Moreover, to make sure that the solution we got is feasible we run the model fixing all courses as we found in the previous step (the combined solution) and using the original file that contains all students for all groups, the result was feasible for all the students. This step is only to double check the feasibility of the solution and make sure that the process of dividing and solving the sub problems did not effect the feasibility of the solution and to make sure that the python codes did not remove any student which may result in generating infeasible solution.

In order to reduce the number of students taking three exams back-to-back on the same day, we solved a real-world exam scheduling issue at the King Fahd University of Petroleum and Minerals (KFUPM) and discussed our experience in this article. Additionally, it tries to spread out exam periods. We broke the issue down into three subproblems since it was so difficult (prep year, undergraduate, graduate). For the problem- solving process, we used a four-stage hierarchical method. In the first step, we solved (fixed) every graduate course that no undergraduates were enrolled in. The prep year courses were next, followed by the undergraduate courses, and finally all the courses taken by both students were solved (fixed).

## Keywords
Terms, Exam, scheduling, Optimization, Heuristics