MATH 311 Final Project

The goal of this project is to create an interactive, practical program that accomplishes a given task. You will work in groups and each group will give a presentation showing the results of their project. You will also turn in a short report and your code. In the report and the class presentation, provide details about the theory and implementation of your project. You will be graded on how well you solve the given task, on the versatility of the program, and on the clarity of your presentation. The projects are somewhat open-ended, and you are free to take certain creative choices with the implementation and solution strategy.

Task: Design an optimal course schedule that assigns courses to the faculty of the Math Department, while meeting various requirements and preferences of the University and the faculty members. Your algorithm for this task should accept as input the following data:

1. For each course:
   a. Time-of-day/day-of-the-week restrictions for the class (e.g. Precalc must be offered on MTRF, 8:00-9:00, 11:00-12:00, or 2:00-3:00)
   b. Number of days-per-week/hours-per-day the class meets (e.g. Precalc meets 4 days a week, 50min each day)
   c. Number of credits the class counts for (e.g. Precalc is 4 credits)
   d. The expected enrollment of the class
   e. A list of classrooms where the class can be held (e.g. OR must be held in a computer lab)
2. For each faculty member:
   a. Preferred times and days of the week that the faculty wants to teach (e.g. Alice doesn't want to teach earlier than 10:00am; Bob wants to teach at most four days a week)
   b. Teaching load of the faculty (e.g. Clifford has to teach 12 credits)
   c. Number of distinct courses the faculty member wants to teach (i.e., number of preps)
   d. The faculty member's preference for teaching each course (e.g., Dylan prefers to teach courses from the set {Precalc, Calc 1, Calc 2, Linear Algebra, Abstract Algebra}, prefers not to teach courses from the set {Differential Equations, Numerical Methods, Dynamical Systems, Functional Analysis}, and is indifferent about the other courses.
3. The availabilities of classrooms, and the capacity of each classroom
4. Pairs of classes that cannot be taught at the same time (e.g. Calc 1 and Linear Algebra are both core courses and should not overlap because many students need to take both)

Given this input, your program must assign a faculty member, classroom, and class time to each class. The assignment found by the program should satisfy all the "hard constraints" (e.g. number of available classrooms) and be optimal with respect to the "soft constraints" (e.g. faculty preferences). It's up to you to decide what exactly the program tries to optimize (e.g. maximize the number of faculty who have all their preferences met, minimize the number of violated preferences over all faculty, maximize the weighted sum of everyone's preferences, or maximize nothing as long as all constraints are met). Be creative and have fun!