

Research Article

University Course Timetabling Problem with Professor Assignment

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One of the decision problems in many organizations and institutions is to decide how to schedule different tasks, in particular, in higher education institutions. One of the main problems is the university course timetabling problem (UCTP): this problem consists of the allocation of events (courses, professors, and students) to a number of fixed time slots and rooms, this at the beginning of each academic period of the universities. The existent formulations include particular requirements from different educational levels and institutions, as in our case. In this paper, we focus on the university course timetabling problem with the assignment of professor-course-time slot for an institution in Mexico. Timetabling is constructed for the disciplinary courses that are offered by one of the academic departments. The main characteristics are as follows: (1) there are full-time and part-time professors; (2) a mandatory fixed number of courses has to be assigned to each full-time professor according to their academic profile; (3) there is a maximum number of courses assigned to part-time professors; (4) a professor-course matrix that specifies the valid assignation is defined; and (5) mandatory time periods for courses in different semesters are established and other traditional constraints. We present the integer linear programming model proposed to solve the case studied. The optimal solution was obtained with low computational effort through the classical branch-and-bound algorithm. We describe the complete timetable to show the model effectiveness.

1. Introduction

The timetabling problem has many variations such as educational timetabling, nurse rostering, sports timetabling, employee timetabling, and transport timetabling [1]. Here, we focused on educational timetabling, in specific, the university timetabling problem that has been studied extensively through the years due to its wide range of applications [2]. University timetabling problems can be divided into examination timetabling and course timetabling problem (UCTP). The latter is divided into two subcategories: post-enrollment-based course timetabling [3], which implies the assignment of lecture events to time slots and rooms, and curriculum-based course timetabling [4], which deals with the weekly assignment of a set of lectures for various university courses to specific time slots and rooms.

Recently, the International Timetabling Competition of 2019 [5] focuses on the creation of rich real-world datasets of university course timetabling problem in which the aim is to find an optimal assignment of times, rooms, and students to events related to the set of courses. In the competition, the use of hard and/or soft constraints was allowed and the objective was to minimize the penalties of soft constraints as well as minimize the student conflicts.

Some authors have been working to describe the main characteristics, advances, and applications for UCTP-related problems; for example, Babaei et al. [6] present a review of the different approaches proposed to solve the problem. Vrielink et al. [7] provide up-to-date information about timetabling in higher education institutions (HEIs).

The review presented by them shows the differences and similarities in the theory and practice of timetabling research

