

# A Transdisciplinary Approach to the Academic Timetabling Problem

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**Abstract.** Higher education institutions must decide every term a) which courses to offer along with the number of sections for each, and b) which professors will teach which subjects and sections in which facilities (classrooms, laboratories etc.). This challenge, known as Academic Timetabling, forms the operational backbone of every higher education institution. It involves optimising the use of the institution's resources (academic programs, physical infrastructure, human and economic); safeguarding financial and academic performance; enhancing stakeholder satisfaction; and preserving the long-term reputation of the institution. While much of the existing academic literature offers quantitative models designed to optimise the use of infrastructure and human resources in benchmark problems, comprehensive industrial real-size applications are comparatively scant. The primary contribution of this article is not a new mathematical model or algorithm for solving timetabling problems. Instead, it introduces a transdisciplinary framework to address the literature gap on real-size instances. The framework serves as a decision support tool that considers all campus stakeholders (professors, students, university operations executives, department and program chairs, information technology, and corporate governance), all majors, and all facilities (classrooms, laboratories, etc.). The objective is to maximise the expected academic performance by assigning professors to courses, sections, and time slots that best align with their preferences and profile affinity; this is achieved through a quantitative model embedded in a broader, transdisciplinary approach. Moreover, the framework includes elements to guide its implementation. The paper provides an example of an industrial-size instance to illustrate the framework to benefit practitioners.

**Keywords.** Academic timetabling, decision support tools and methods, discrete optimisation, key value indicators, systemic performance measurements, transdisciplinary approach, university stakeholders

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