

# Course Descriptions None 2024-2025

Course Title Modelling and Computing  
Course Code EBC2180  
ECTS Credits 6,5  
Assessment Whole/Half Grades

Period	Start	End	Mon	Tue	Wed	Thu	Fri
4	3-2-2025	30-3-2025		X		X	

Level no level  
Coordinator Tom van der Zanden For more information:t.vanderzanden@maastrichtuniversity.nl  
Language of instruction English

- Goals
- \* Understand combinatorial optimization problems.
  - \* Model combinatorial optimization problems.
  - \* Analyse time complexity of algorithms using big O-notation.
  - \* Suggest an algorithm solving a combinatorial optimization problem either to optimality or approximately.
  - \* Implement an algorithm in a programming language such as Java.
  - \* Classify the complexity of a combinatorial optimization problem.
  - \* Identify which instances sizes of a problem are (in-)tractable using an algorithm.

Description

When operating a business, we often have to solve optimization problems to use available resources as efficiently as possible. Consider for instance a package delivery service: we must determine which packages to load into which vans, so that the total fuel costs of delivery are minimized. Often, there are many additional constraints that must be taken into account: for instance, the maximum loading capacity of a van and the maximum distance a driver is allowed to drive in one day. Clearly, with so many constraints, it becomes difficult to see if a solution exists at all, let alone to find one with minimum cost. This course introduces the students to the basics of modelling, algorithms and intractability to give them the tools to deal with these kinds of problems. The course will cover modelling business problems using (integer) linear programming, maximum flow and boolean logic and cover algorithmic techniques such as dynamic programming, greedy algorithms, the simplex method, local search and using solvers as black boxes. Simultaneously, the students are introduced to the intuition behind NP-hardness and reductions, and will be introduced to a set of canonical "hard" problems that can be used to assess the hardness of a business problem. By the end of the course, students will be able to take a business case and create several formulations of optimization problems related to such a case. For such a formulation, students will have an intuition of how hard it is to solve (any why), and be able to determine which algorithmic technique is suitable to tackle it.

Formative assessment: Assignment 1,2 and 3 and feedback during tutorial meetings and mock exam

Summative assessment: Assignment 4 and 5, and exam

Instructional approach: Lectures, working sessions (exercices and flipped classroom) and programming assignments, including feedback

Literature

Prerequisites

Keywords

Teaching methods

Assessment methods

Written Exam

Evaluation in previous academic year

For the complete evaluation of this course please click <http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM>

This course belongs to the following programme / specialisation

Bachelor Business Analytics

Year 2 Compulsory Course(s)