UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

DOTTORATO DI RICERCA / PHD PROGRAM IN
INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING

Ad hoc course announcement

Title: **Operational Research: Mathematical Modelling, Methods and Software Tools for Optimization Problems**

Lecturer: **Prof. Adriano Masone**

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CV: *Adriano Masone is an Assistant Professor in the Department of Electrical Engineering and Information Technology at the University of Naples Federico II. He received his Ph.D. in Information Technology and Electrical Engineering from the University of Naples Federico II in 2020. In 2018–2019, he was a Visiting Scholar at the Robert H. Smith School of Business, University of Maryland, USA. In 2022, he was awarded the Glover-Klingman Prize by the international journal Networks. His research focuses on exact and heuristic methods for solving complex combinatorial and network optimization problems, with applications in healthcare, transportation, and logistics.*

Credits: **4**

Overview

Operational Research is the discipline of applying advanced analytical and quantitative methods to support better decision-making. The course teaches students how to formulate mathematical models of optimization problems, classify such models, and understand the mathematical foundations of the algorithmic techniques used to solve them. Furthermore, the course includes a laboratory component focused on modelling and the use of optimization software. Finally, optimization problems arising from real-world case studies in various application fields, together with the corresponding solution approaches, will be discussed at the end of the course. The course duration is 12 hours. It includes five two-hour lectures and a final two-hour assessment.

Schedule

Lecture	Date	Room	Time	Topics
1	06/07/26	OPSLab	10:00-12:00	Model building in mathematical programming
2	08/07/26	OPSLab	10:00-12:00	Optimization solver: Gurobi
3	10/07/26	OPSLab	10:00-12:00	Discrete and graph optimization
4	13/07/26	OPSLab	10:00-12:00	Mathematical programming under uncertainty
5	15/07/26	OPSLab	10:00-12:00	Advanced optimization methods
	TBD	TBD	TBD	Assessment test

I Lesson
Operational Research applications and their relationships with other disciplines. Model building in mathematical programming: data, variables, constraints, objective functions, and decision-makers.

II Lesson
Introduction to the use of the optimization software Gurobi. Modelling and solving a decision problem using Gurobi. Branch-and-cut implementation with Gurobi.

III lesson
Discrete and graph optimization. Binary, pure, and mixed-integer linear optimization formulations. Relaxation techniques and exact solution methods (branch-and-bound and branch-and-cut).

IV Lesson
Introduction to stochastic programming models, focusing on the objectives of the decision process, the constraints on those decisions, and their relationships to the random elements.

V Lesson
Applications of advanced solution methods to real problems arising in different application fields.

Notes

Participants are requested to join the course's MS Teams group to access the materials using the following code: **bk1vx3r**.

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