

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 at the Department of Electrical Engineering and Information Technology at the University of Naples Federico II. He obtained his Ph.D. in Information Technology and Electrical Engineering in 2020 from the University of Naples Federico II. In 2018–2019, he was a Visiting Scholar at the Robert H. Smith School of Business at the University of Maryland, Maryland, USA. In 2022, he was awarded the Glover-Klingman Prize by the international journal Networks. His areas of research include exact and heuristic solution methods for 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 help make better decisions. The course teaches how to build mathematical models of optimization problems, to classify models, and to understand the mathematical foundations of algorithmic techniques that enable their solution. Furthermore, the course includes a laboratory component with an emphasis on modelling and the use of an optimization software. Finally, optimization problems arising from real case studies in various application fields and their related solution approaches will be discussed at the end of this course. The course duration is 12 hours. It includes five two-hour lectures, one per week, and a final assessment of two hours.

Schedule

Lecture	Date	Room	Time	Topics
1	02/07/24	C2A Building 3	10.30-12.30	Model building in mathematical programming
2	09/07/24	C2A Building 3	10.30-12.30	Discrete and graph optimization
3	16/07/24	I4 Building 1	15.00-17.00	Mathematical programming under uncertainty
4	23/07/24	T4 Building 1	10.30-12.30	Optimization solver: Gurobi
5	30/07/24	T4 Building 1	10.30-12.30	Advanced optimization methods
	TBD	TBD	10.30-12.30	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

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).

III 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.

IV Lesson

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

V Lesson

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

Notes

Participants are requested to join the following MS Teams group:

https://teams.microsoft.com/l/team/19%3A48o0WHGKtW0DMEFZbEVfOtJRoWIT797SWSOOcRaL_181%40thread.tacv2/conversations?groupId=5d86ed51-534d-4922-a8e7-bc657d2e784e&tenantId=2fcfe26a-bb62-46b0-b1e3-28f9da0c45fd

Once accepted in the Teams group, students have to fill the following .xlsx file with their information:

https://communitystudentiunina.sharepoint.com/:x/s/OperationalResearchMathematicalModellingMethodsandSoftwar976/ESYBHYt6O81MktE4X1pe8EQBFMF6Qn6zVNBnXH_tDbdCrA?e=ML6fT9

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