

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**

*Università degli Studi di Napoli Federico II*  
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**CV:** *Adriano Masone is an Assistant Professor at the Department of Electrical Engineering and Information Technology of the University of Naples Federico II. He obtained his Ph. D. in Information Technology and Electrical Engineering in 2020 at the University of Naples Federico II. In 2018–2019, he was a Visiting Scholar at the Robert H. Smith School of Business of the University of Maryland, Maryland, USA. His areas of research include exact and heuristic solution methods for complex combinatorial and network optimization problems with application to healthcare, transportation and logistics*

**Credits:** **4**

## Overview

Operational Research is the discipline of applying advanced analytical and quantitative methods to help making better decisions. The course teaches how to build mathematical models of optimization problems, to be able to classify models and to know the mathematical foundations of algorithmic techniques that allow them to be solved. Furthermore, the course includes a laboratory part with emphasis on modelling and the use of commercial optimization software. Finally, optimization problems arising from real case studies in different application fields, and the related solution approaches, will be discussed at the end of this course. The course duration is 12 hours. It foresees five two-hours lectures, one per week, and a final assessment of two hours.

## Schedule

Lecture	Date	Room	Time	Topics
1	14/09/22	Meeting room IV floor	10:30-12:30	Model building in mathematical programming
2	21/09/22	Meeting room IV floor	10:30-12:30	Discrete and graph optimization
3	28/09/22	Softel I floor	10:30-12:30	Optimization solvers: Fico-Xpress
4	05/10/22	Softel I floor	10:30-12:30	Optimization solvers: Gurobi
5	12/10/22	Softel I floor	10:30-12:30	Advanced optimization methods
	TBD		TBD	Assessment test

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### **I Lesson**

Operations Research applications and relations with other disciplines. Model building in mathematical programming: data, variables, constraints, objective functions, decision-makers.

### **II Lesson**

Discrete and graph optimization. Binary, pure, and mixed-integer linear optimization formulations. Relaxations, branch-and-bound and branch-and-cut.

### **III lesson**

Introduction to the use of the optimization software FICO-Xpress. Modelling and solving a decision problem using FICO-Xpress.

### **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 to the Module are requested to e-mail to prof. Adriano Masone the following: Student name, name of the PhD course and cycle.

For information: Prof. Adriano Masone (DIETI, UniNA) – [adriano.masone@unina.it](mailto:adriano.masone@unina.it)