ORCO

Master of Science in
Operations Research, Combinatorics and Optimization

International master's program fully taught in English.

This program is offered jointly by Université Grenoble Alpes (UGA) Faculty of Science, IM²AG and Grenoble INP Ensimag, UGA / France

Modeling and optimizing complex systems play a major role in addressing current social and economic challenges such as integration of sustainable issues in organizations and industrial systems, efficiency and viability of territorial organizations, competitiveness and innovation of companies, etc.

As a result, Operations Research, Combinatorics and Optimization are very active areas of research both in R&D labs and in the academic world. In Grenoble, in particular, several teams of researchers from UGA, Grenoble INP, CNRS and INRIA are recognized worldwide for their work in these fields. The methods and tools of the field range from Applied Mathematics to Computer Science and skills in these areas are required to develop advanced solutions. This master program offers a high level training on methods and tools in Operations Research, Combinatorics and Optimization for data driven decision making. It aims at preparing students to actively contribute to the development of the field, both in academia and in industry.

http://orco.imag.fr

Objectives

› **Study of advanced and efficient methods and tools of Operations Research, Combinatorics and Optimization** (Mathematical Programming, Graph Theory, Complexity Theory, Stochastic Programming, Heuristics, Approximation Algorithms, Robust Optimization, etc.)

› **Emphasis on the use of these methods to implement efficient solution techniques for complex industrial applications** (in supply chain management, scheduling, transport, etc.)

› **Preparation for research positions** (in industry and academia)

Academic program

This master program is a one-year (M2) specialized program. This list is not exhaustive

Common core
18 ECTS
› Advanced models and methods in operations research
› Combinatorial optimization and graph theory
› Optimization under uncertainty

Elective courses
Choose a total of 12 ECTS among the following courses:
› Constraint Programming, applications in scheduling *(3 ECTS)*
› Graph and discrete structures *(3 ECTS)*
› Transport Logistics and Operations Research *(6 ECTS)*
› Academic and Industrial Challenges *(3 ECTS)*
› Statistical learning: from parametric to nonparametric models *(6 ECTS)*
› Learning, Probabilities and Causality *(6 ECTS)*
› From Basic Machine Learning models to Advanced Kernel Learning *(6 ECTS)*
› Mathematical Foundations of Machine Learning *(6 ECTS)*
› Knowledge representation and reasoning *(6 ECTS)*
› Multi-agent systems *(3 ECTS)*
› SAT/SMT solving *(3 ECTS)*
› Advanced parallel Systems *(6 ECTS)*
› Fundamentals of Data Processing and Distributed Knowledge *(6 ECTS)*
› Scientific Methodology, Regulatory and ethical data usage *(6 ECTS)*
› Large scale Data Management and Distributed Systems *(6 ECTS)*
› Cryptographic engineering, protocols and security models, data privacy, coding and applications *(6 ECTS)*

A five-month project is compulsory *(Master thesis - 30 ECTS)*. It can be done in a R&D department of a private company or in an academic laboratory.

Légende ?

ADMISSIONS

To be admitted in the program, candidates should have previously completed the first year of a master program (M1) in Computer science, Applied Mathematics, Industrial Engineering or Mathematics, or should hold an equivalent degree (the minimum requirement is to have earned at least the equivalent of *240 ECTS credits*).

Basic skills in the following domains would largely be appreciated: graph theory, linear programming.

Candidates can contact the persons in charge of the master program to have references of books and/or articles on these domains to prepare at best.
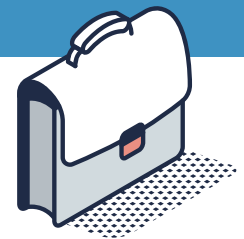
REQUIREMENT
English language competence B2
(see English test scores accepted on our admission webpage)

APPLICATION DEADLINE
Mid May

Contacts
orco@ensimag.fr
masters-admission@ensimag.fr
https://ensimag.grenoble-inp.fr/fr/formation/masters

UGA IM²AG UFR Université Grenoble Alpes

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