



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Quantitative Management Science

2324-1-F7701M092-F7701M088M

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#### Learning objectives

The aim of the course is to provide attending students a modern systemic approach for the analysis and modeling of some of the issues that may arise in a management context.

Concepts and methods dealt in this course are those of operations research and decision theory.

At the end of the course students will achieve a proper knowledge of some management tools that can offer an adequate decision support system. Moreover, the ability to model in quantitative terms will be relevant.

#### Contents

Optimization problems and their modelling.

Linear programming.

Integer linear programming.

Decision trees: Value of information and value of perfect information.

#### Detailed program

##### 1. Optimization problems and models:

- Problems of production, investment, facility location, assignment, transportation, flow, project planning
- Models based on continuous, integer or binary variables, formulation of objectives and constraints using linear functions
- AMPL software

## 2. Linear Programming:

- \* Fundamental theorem of linear programming
- \* Duality and complementary slackness theorem
- \* Bases: complementarity, degeneracy and optimality
- \* Simplex algorithm
- \* Sensitivity analysis
- \* Hints of multi-objective linear programming

## 3. Integer Linear Programming:

- \* Geometry of integer linear programming
- \* Branch & Bound method

## 4. Decision trees:

- Basic definitions and examples
- Value of information: value of sampled information and value of perfect information

## Prerequisites

Linear algebra and basic notions of probability.

## Teaching methods

Frontal lessons and exercise sessions.

## Assessment methods

Two in-progress written exams (exercises as a check of disciplinary problem solving skills) are conducted during the course: the first exam covers modeling optimization problems and Linear Programming; the second exam covers Integer Linear Programming and decision trees.

The final exam consists of a compulsory written exam (exercises as a check of disciplinary problem solving skills) and an optional oral exam (interview on topics covered in class).

## Textbooks and Reading Materials

Reference books:

- F.S. Hillier, G.J. Lieberman, Ricerca Operativa - Fondamenti, McGraw-Hill, 2010.
- C. Vercellis, Ottimizzazione. Teoria, metodi, applicazioni, McGraw Hill, 2008.
- F. Schoen, Modelli di ottimizzazione per le decisioni, Esculapio, 2006.
- M. Pappalardo, M. Passacantando, Ricerca Operativa, Pisa University Press, 2012.

Additional materials will be provided during the course.

## **Semester**

First semester.

## **Teaching language**

Italian.

## **Sustainable Development Goals**

QUALITY EDUCATION

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