UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Ricerca Operativa e Pianificazione delle Risorse

1920-3-E3101Q128

Aims

Operations research (OR) is the study of scientific tools that deals with the application of advanced analytical methods to help make better decisions. It is a key branch of applied mathematics with applications in a wide spectrum of areas including computer science, engineering and economics.The goal of this course is to teach students to formulate mathematical models that represent real-world problems and to recognize approaches and tools to solve these models.

Namely, we will cover nonlinear, linear, network flow and integer optimization problems, with applications in planning, economics, business, and engineering.

Contents

A. Non Linear Optimization

B. Linear & integer Optimization

C. Soft Computing for Optimization

Detailed program

A. Non Linear Optimization

2. One Variable Unconstrained Minimization :Dichotomy Search - Bisection Method - Newton Method.

3. Multi-Variable Unconstrained Minimization : Gradient Method, Newton Method.

4. Multi Variable Constrained Minimization :Karush-Kuhn-Tucker conditions

B. Linear Optimization

5. Introduction to Linear Programming: Assumptions for LP, Modeling strategies

6. Graphical solution: Graphical solutions to linear programs.

7. Linear Programming Geometry and the Simplex Method

8. Duality and Sensitivity analysis

9. Binary and Mixed integer problems: problems' formulation and Branch & Bound solution procedure

C. Soft Computing for Optimization

5. Evolutionary programming

6. Neural network & SVM

Prerequisites

Familiarity with linear algebra (linear independence, solving systems of equations, basic matrix algebra), basic programming, (multi-variable) differential calculus and probabilities.

Teaching form

Lectures, exercises and demo using sw

The course will be delivered in Italian.

Textbook and teaching resource

Main textbook

Frederick S. Hillier and Gerald J. Lieberman, Ricerca Operativa, McGraw-Hill, 9th edition, 2010.

Additional textbooks

Dimitris Bertsimas and John Tsitsiklis, Introduction to Linear Optimization, Belmont, Massachusetts, 2008.

Mokhtar S. Bazaraa, John J. Jarvis, Hanif D. Sherali, Linear Programming and Network Flows, Wiley, 4th edition, 2010.

Mokhtar S. Bazaraa, Hanif D. Sherali, C. M. Shetty, Nonlinear Programming: Theory and Algorithms, Wiley, 3th edition, 2006.

Software

Mathematica: http://www.unimib.it/go/47939/Home/Italiano/Service-Desk/Software-download/Mathematica

Optimization in R: https://cran.r-project.org/web/packages/optimx/optimx.pdf [Rlp] LP in R: https:cran.r-project.org/web/packages/lpSolve/lpSolve.pdf

lp solve: http://lpsolve.sourceforge.net/5.5/, http://web.mit.edu/lpsolve/doc/

Additional Material

Slides of the lectures and solved exercises will also be available

Semester

I semester

Assessment method

There are two alternative exam modalities:

1. Assignments+ Midterm (suggested for students who attend the course)+oral

2. Final written exam + oral

for more detail read Exams Modalities under the sectionIntroduction" in the course page.

Office hours

Enza Messina by appointment

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