UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Metodi Matematici per L'analisi Economica – Ottimizzazione e Analisi Convessa

2425-1-F4001Q095

Aims

In line with the educational objectives of the Master Degree in Mathematics, the course aims at providing the *knowledge* about the fundamental concepts and statements of the theory of optimization and convex analysis in the Euclidean setting. It will also build the *skills* needed to understand and use the most important proving arguments and techniques in the theory and the *ability* to solve exercises and deal with problems exploiting them. Particular emphasis will be put on the theory of nonlinear programming and its relationship with convexity, as well as some results of duality.
At the end of the corse the students are supposed:

1. to have absorbed the pricipal topics of the course and to be able to apply methods and mathematical techniques to solve problems and exercises;
2. to be able to translate problems arising from real situations into models that can be analysed via the mathematical theory developed in the course;
3. to have acquired a proper use of language that enables them to communicate in a clear and rigorous way what they have learnt.

Contents

Finite-dimensional optimization, elements of convex analysis, duality theory, multiobjective optimization.

Detailed program

Introduction to optimization problems. Basic calculus tools in Rn.

Unconstrained optimization.

Ekeland variational principle.

Transposition theorems.

Convex analysis for sets and functions.

Nonlinear programming.

Duality theory and convex programming.

Introduction to vector optimization.

Partially ordered vector spaces.

Solution of a vector optimization problem.

Scalarization and optimality conditions.

Prerequisites

Basic concepts and results of linear algebra and analysis in finite-dimensional spaces.

Teaching form

All lessons are conducted in person in a classroom setting.

Textbook and teaching resource

Referenze:
O. Guler, Foundations of Optimization, Springer, 2010 (available as e-book)
S. Boyd and L. Vandenberghe, Convex Optimization, Cambridge University Press, 2009
M. Ehrgott, Multicriteria Optimization, Springer 2005

Ulteriori referenze:
M. S. Bazaraa, H. D. Sherali, C. M. Shetty, Nonlinear Programming, John Wiley & Sons, 1993
L. Berkovitz, Convexity and Optimization in R?, John Wiley & Sons, 2002
J. Jahn, Vector Optimization, Springer, 2011

Semester

I

Assessment method

Examination type:

1. there are no intermediate exams.
2. in both written and oral part of the exam are judged: the knowledge of the techniques shown during the course, the accuracy of the line of thinking, the ability to illustrate the results of the course
3. the evaluation of both written and oral exams will take into account mainly of the knowledge of the subjects and the accuracy of the line of thinking.

Written and oral examination

a) The written part consists of exercises where the students show their ability in using methods and tools introduced in the course, as well as theoretical questions. If the mark of the written exam is between 18/30 and 26/30, then the final grade is the grade of the written exam. If the grade of the written part is greater than or equal to 27/30, the student obtains at most 27/30 as final grade unless he/she decides to undergo the oral part.

b) The oral part consists of statements and proofs of theorems from a detailed list, as well as theorical exercises. It is only for students with mark not less than 27/30 in written examination. It consists in:

- discussion about the written part;
- the student must show his competence on the subjects considered in the lectures (i.e., statements and proofs of theorems from a detailed list, theorical exercises)

If the grade of the written part is more, or equal to 18, the student can decline it al most twice.

Office hours

By appointment.

Sustainable Development Goals