INMA2460 Optimization : Nonlinear programming

[30h+15h exercises] 4 credits

This course is taught in the 2nd semester

Teacher(s): Yurii Nesterov
Language: French
Level: Second cycle

Aims

Introduce a modern theory of optimization and general principles of complexity analysis of algorithms for solving nonlinear problems. Present the most efficient algorithmic schemes.

Main themes

General nonlinear optimization. Smooth and non-smooth convex optimization. Interior-point methods. Prerequisites: standard undergraduate level in Linear Algebra and Calculus.

Content and teaching methods

-General problem of nonlinear optimization. Black-box concept. Iterative methods and analytical complexity. Gradient method and Newton method. Local complexity analysis.
-Convex optimization: convex sets and functions; minimization of differentiable and non-differentiable convex functions; lower complexity bounds; optimal methods.
-Interior-point methods: notion of self-concordant functions and barriers; path-following methods; structural optimization.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

- copy of transparencies and of the text of the lectures.
- Yu.Nesterov. "Introductory lectures on convex optimization. Basic course." Kluwer 2003
- P. Polyak, « Introduction in optimization », J. Willey & Sons, 1989
- Yu. Nesterov, A. Nemirovsky, « Interior-point polynomial algorithms in nonlinear optimization », SIAM, Philadelphia, 1994.
The course is given in English.
Evaluation: a written exam (in French or in English).

Other credits in programs

MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(4 credits)
MAP23	Troisième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(4 credits)
MATH22/G	Deuxième licence en sciences mathématiques	(4 credits)