CES7AC OPTIMIZATION

CES7AC Optimisation	ECTS Credits: 4 Duration: 36 hours	Semester: S8

Person(s) in charge:

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Keywords:

Optimization

Prerequisites: Linear algebra, differential calculus. Knowledge in linear numerical analysis would be a plus.

Goal: provide with a basic knowledge allowing, given a practical problem, to choose the adapted algoritms

Program and contents:

Objectives
Many problems encountered by engineers in practice can be formulated in terms of optimization (for a cost, an energy or a shape…). The major aim of the present course is to provide future engineers with a basic knowledge allowing, given a practical problem, to choose algoritms adapted to the particular structure of the problem. And also to be able to evaluate the efficiency of the methods as well as their limitations. Part of the class work will be done on Matlab.

Content - Program
This course covers the following subjects:

- Unconstrained optimization:

Analysis (well-posedness of the problem). First and second order optimality conditions, use of convexity. General classes of algorithms: steepest descent, conjugate gradient, quasi-Newton methods. Line search algorithms for choosing an adequate step-length. Global convergence and asymptotic convergence of the algorithms.

- Constrained optimization:

Analysis (well-posedness of the problem), optimality conditions. Equality or inequality constraints. Feasible directions. Lagrange and Kuhn and Tucker theorems. Convex problems. Gradient projection and penalty methods. Lagrange-Newton method. The Lagrangian, saddle points and duality. Uzawa method and extensions.

Abilities:

Levels	Description and operational vocabulary
Know	
Understand	
Apply	
Analyze	
Summarize	
Evaluate	

Evaluation:

☑ Written test	☐ Continuous assessment	☐ Oral presentation	☑ Project	☐ Written report