2SC7710 – Numerical methods and problem solving for optimizing embedded energy systems

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Department: DÉPARTEMENT SYSTÈMES D'ÉNERGIE ÉLECTRIQUE
Language of instruction: FRANCAIS
Campus: CAMPUS DE PARIS - SACLAY
Workload (HEE): 60
On-site hours (HPE): 34,50

Description

The optimization of embedded energy systems is a daily problem encountered in the industrial world (aeronautics, space or automotive). The objectives encountered are the gain in volume, cost (optimal design or operating cost), performance or efficiency. The system and multiphysics aspect of the design is now taken into account in order to best meet increasingly demanding specifications.

Numerical methods used: multi-criteria optimization, parameter estimation, dynamic programming, stochastic algorithms.

You will be offered projects under four themes:

- **Energy efficiency**
- **Optimization of electric actuators**
- **Optimal network management**
- **Optimization of a propulsion chain**

You are invited to choose the project you are most interested in under each theme. At the end you will be assigned a single project.

Quarter number
ST7

Prerequisites (in terms of CS courses)
Electrical Energy
Transport Phenomena

Syllabus
Problem formulation
Models related to optimization
Optimization of energy systems

Stochastic optimization (simulated recruit, genetic algorithms, differential evolution)
Parameter estimation
Dynamic programming
Multi-source optimization
Multi-criteria optimization

Class components (lecture, labs, etc.)
Lectures: 24h
TD/TP : 9h

Grading
Written exam : 1h30
Evaluation of the practical work

Course support, bibliography
Course presentations
Matlab files

Resources
Lecture, TD, TP, Project

Learning outcomes covered on the course
Optimization
Systems
Optimization of embedded systems
Stochastic optimization

Description of the skills acquired at the end of the course
The student will be able to implement an optimization of an embedded system.
- problem formalization
- mathematical optimization
- results analysis
- multi-objectives