

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