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## 2SC5793 – Design of a coating : Control of electromagnetic pollution

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**Instructors:** Anna Rozanova-Pierrat

**Department:** DOMINANTE - MATHÉMATIQUES, DATA SCIENCES

**Language of instruction:** FRANCAIS

**Campus:** CAMPUS DE PARIS - SACLAY

**Workload (HEE):** 40

**On-site hours (HPE):** 27,00

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### Description

We are positioning ourselves on the industrial stakes which impose the economic constraints and the technological constraints necessary to improve the existing products of the market, this in order to absorb the electromagnetic waves. As fields of application, we aim at the design / optimization of electromagnetic anechoic chambers. It is noted that the absorbent materials (there will be an anechoic chamber visit in the Bréguet building and eventually of Thales-Limours) for the electromagnetic waves are different dissipative materials for acoustic waves.

### Quarter number

ST5

### Prerequisites (in terms of CS courses)

The course "Engineering of waves" of the 1st year will be a plus.

The courses of ST5 and in particular the course "Theory and algorithmics for wave control" (one of two proposed tracks).

### Syllabus

Team work "company", definition of issues, bibliographic research, physical understanding and practical interest, mathematical modeling of the problem, development of the corresponding mathematical theory if necessary (the problem well or badly posed, regularity of the solution , derivation of the electromagnetic energy with respect to the geometry of the wall, influence of the choice of the chosen porous material on the absorption of the energy, ...), development / implementation of the numerical method, the numerical analysis of the results , the analysis of their relevance, possible improvement, obtaining an effective form for a broad band of frequencies.

**Class components (lecture, labs, etc.)**

Teamwork, project, dialogue with various specialists in the field.

**Grading**

Report, final and intermediate deliverables, defense by team

**Resources**

Computer room

Students will perform modeling, simulation, visualization and rendering of the chosen phenomenon. They will study the simulation chain with a goal of performance and precision under economic constraints (manufacturing cost) and environmental (gain in decibel or potential).

Deliverables: report, software, transparencies and defense

**Learning outcomes covered on the course**

- Understand the contribution of geometry in the design and development of new products
- Understand the theoretical and numerical techniques of controlling electromagnetic waves
- Implement numerical methods to simulate phenomena of propagation of large electromagnetic waves (problems for a wide band of frequencies)
- Validate the theoretical and numerical techniques of the control of the electromagnetic waves
- Confront students with the realization of a complex product by numerical simulation techniques

**Description of the skills acquired at the end of the course**

C4, C6, C7