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## 2SC8192 – Optimization of parts for biomedical applications in polymer additive manufacturing

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**Department:** DOMINANTE - CONSTRUCTION VILLE TRANSPORTS

**Language of instruction:** ANGLAIS

**Campus:** CAMPUS DE PARIS - SACLAY

**Workload (HEE):** 80

**On-site hours (HPE):** 48,00

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### Description

Optimization of a training box for medical application designed entirely in additive manufacturing. Topics may concern the design of the assembly, the measurement chain, the optimization of the material of artificial organs (ultrasound impression) ...

### Quarter number

ST7

### Prerequisites (in terms of CS courses)

To have completed the “continuum mechanic” SPI course and at least one of the following courses: Materials, Transport phenomena, Thermodynamics.

### Syllabus

The students will be divided into teams of 5 maximum. Each team will have to optimize the design of a polymer part subjected to complex mechanical or multiphysical loads by integrating that the process must be additive manufacturing. The topics may concern the materials of artificial organs or the system in which they are installed.

step 1 : Getting to know the subject

step 2 : Simplified representation of the studied part to reach a first optimum on a first field of parameters.

step 3 : Optimization of the system in a new parameter space closer to the real system modeled by advanced methods.

step 4 : Analysis of the cost benefits of the proposed solution compared to the classical solution, e.g. manufacturing time, cost of materials, manpower used, environmental compatibility...



Most topics involve finite element simulation on COMSOL or the software of the students' choice. Some topics may involve experimental work.

### **Grading**

C2 and C8 skills will be evaluated throughout the project, which will end with a defense in the presence of the industrial partner. Competencies C2 and C7 will be evaluated during the defense. The partner will evaluate the C4 competence.

Continuous assessment during the project (C2, C8) : N1

Teachers' grade for the oral defense (C2, C7) : N2

Industrial partners' mark (C2, C4, C7) : N3

$NF = 30\%N1 + 30\%N2 + 40\%N3$

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

C2 Develop an in-depth competence in an engineering field and in a family of professions

C4 Have a sense of creating value for your company and your clients

C7 Know how to convince

C8 Lead a project, a team