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## 2SC8193 – Optimization of civil engineering structures in additive concrete 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

Project to answer a problem proposed by a partner of the civil engineering industry around the optimization of the design of a part in additive manufacturing concrete or plaster.

### 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, Thermodynamic.

### Syllabus

Students are divided into teams of up to 5. Each team must optimize the design of a large civil engineering part subjected to complex mechanical and even multiphysical loads. This may involve optimize its geometry, to think about its design, to design a system for a given use system for a given use, analyze the performance of a part already designed by already designed by additive manufacturing... This work must take into account the This work must take into account the specific capabilities and restrictions of the concrete or plaster additive manufacturing process.

step 1: Getting to know the subject

step 2 : Simplified representation of the studied part to reach a first optimum

first optimum on a first field of parameters.

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



step 4 : Analysis of the cost benefits of the proposed solution compared to the usual 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 Some topics may involve experimentation.

### **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 for the oral defense (C2, C4, C7) : N3

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

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

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

C4 Have a sense of value creation for his company and his customers

C7 Know how to convince

C8 Lead a project, a team