2SC8191 – Optimization of aeronautical parts in metal additive manufacturing

Instructors: Camille Gandiolle, Andrea Barbarulo
Department: DOMINANTE - CONSTRUCTION VILLE TRANSPORTS
Language of instruction: ANGLAIS
Campus: CAMPUS DE PARIS - SACLAY
Workload (HEE): 80
On-site hours (HPE): 48,00

Description
Project to respond to a problem proposed by a partner from the aerospace industry around the optimization of the design of a part in metal additive manufacturing.

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
Students are divided into teams of 5 maximum. Each team must optimize the design of a metal part subjected to complex mechanical and/or thermal loads, or even multiphysics. This may involve optimizing its geometry, thinking about its design, designing a system for a given use, analyzing the performance of a part already designed by additive manufacturing... This work must take into account the specific capabilities and restrictions of the additive manufacturing process.

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, labor employed, 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

Resources

COMSOL and the school's software and experimental resources

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