

# Multidisciplinary design



Level  
BAC +4



ECTS  
4 credits



Component  
INSTITUT  
NATIONAL  
DES SCIENCES  
APPLIQUEES  
TOULOUSE



Number of  
hours  
44h

## Presentation

### Description

#### **Design of Experiment (DoE)**

Accounts.- Practical exercices.- Practical work using Explaser, an interactive simulator of industrial process : to solve a multi parameter problem of laser soldering. In a first stage, all calculations are made by hand without any helps of softwares, in order to understand the mechanic of the calculations and the manner of establishing effect graphisms of factors and of their interactions.- Application of the method to the improvement of a catapult : the Statapult.

#### **Surrogate models and sizing of mechatronic systems**

The lectures take the forms of videos (moodle SPOC) and interactive quiz.

Program: design drivers, sizing scenarios, surrogate models, estimation models with scaling laws, life time evaluation, profil mission simulation, optimization, sizing procedure definition, numerical solver.

Projects examples: Optimal preliminary design of thrust vector control actuation system (Ariane, Vega), supercapacitor

charge converter (chopper), flight control actuator (spoiler, aileron), last mile delivery electric vehicle...

### Objectives

#### **Design of experiments**

To know the global concepts of DoE and understand the interest of the tool.

#### **Surrogate models and sizing of mechatronic systems**

To explain the process and the different models usefull for the optimal sizing of mechatronic systems.

The student will be able to:

#### **Design of experiments**

- To be able to define and set into work some tests allowing to get an optimistic process.
- To carry out one's own design of experiments.

#### **Surrogate models and sizing of mechatronic systems**

- To define the sizing scenarios of a technical system

- To establish the estimation models and simulation modes of the set of components
- To set a design procedure and to define the optimization problem
- To Implement the calculations in a numerical environment

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## Pre-requisites

Probability (basic), statistics (basic), notions of system architecture (mechanical, hydraulic, electric, etc.)

## Useful info

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### Contacts

#### Education manager

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### Place

➤ Toulouse