Master of Science in Mechanical Engineering

# Computational Mechanical Design

CM3



# Contacts





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#### **Track description**

possibilities in terms of the mechanical design of lightweight and high-performance. drive the design, speed up time to production and eliminate costly design mistakes. material/multi-physics approaches.

### Emerging technologies, such as topology optimization and multi-material additive manufacturing, are opening new

- Simulation is becoming vital: effective modelling can help
- By attending the Computational Mechanical Design track, students will acquire the technical skills, methods and principles to design disruptive mechanical systems and their components by using advanced multi-scale/multi-

# Skills

Students will learn how to:

- manage and master multi-scale multi-physics modelling (FEM, CFD, ...) of components and systems
- plan lab experiments for the testing of material behaviour in complex working conditions
- design innovative components combining structural (topology) optimization and innovative multi-material solutions
- process real-life sensor data from components/systems through suited models



### **CM3: Core Courses**

#### **Course Title**

Energy Technologies for Efficient and Decarbonized Industry

Advanced Dynamics of Mechanical Systems

Advanced Machine Design

Advanced Manufacturing Processes B

Production Management

Advanced Materials for Mechanical Engineering

| YEAR | SEM | ECTS | ECTS GROUP |
|------|-----|------|------------|
| 1    | 1   | 10   | 10         |
| 1    | 2   | 10   | 10         |
| 1    | 2   | 10   | 10         |
| 1    | 1   | 5    | 5          |
| 1    | 2   | 5    | 5          |
| 1    | 1   | 5    | 5          |

## CM3: Track Specific Courses

#### **Course Title**

Mechanical Behaviour of Materials and Finite Element Simulation

**Computational Fluid Dynamics - Fundamentals** 

Measurements for Mechanical Engineering

Machine Learning and Model Identification for Mechanical Systems

Digital Twin for Health and Usage Monitoring

**Topology Optimisation** 

Surface Modeling for Engineering Applications

Additive Manufacturing B

Simulation Tools for Materials and Processes

#### **Elective courses**

(Computational Fluid Dynamics - Advanced Methods and Applications, Computational Fluid Dynamics - Experimental Assessment Reliability for Aerospace and Mechanical Components, Advanced Design of Machine Elements, ...)

#### Lab course

(Metamaterials and Metastructures, Structural Health and Usage Monitoring in Action, Structural Integrity of Aerospace and Mechanical Components, ...)



|              | YEAR | SEM | ECTS |    |
|--------------|------|-----|------|----|
|              | 1    | 1   | 10   | 10 |
|              | 1    | 2   | 5    | 5  |
|              | 2    | 2   | 5    |    |
|              | 2    | 2   | 5    |    |
|              | 2    | 1   | 5    |    |
|              | 2    | 1   | 5    | 20 |
|              | 2    | 2   | 5    |    |
|              | 2    | 1   | 5    |    |
|              | 2    | 1   | 5    |    |
| , Structural | 2    | 1-2 | 5    | 10 |
|              | 2    | 2   | 5    | 5  |

### CM3: Master's Thesis

Ortho-implant with latticegraded structure Topology and shape optimization of structures Design of a latticebased isostatic mounting device for space applications



Force reconstruction and damage identification through AI of a composite full-scale aircraft stabilizer