CM3 Computational Mechanical Design

LEARNING OBJECTIVES

The Computational Mechanical Design track aims to train mechanical engineers with interdisciplinary and multidisciplinary skills that allow them to master the problems linked to the ever-increasing complexity of mechanical systems and the use of new materials capable of operating safely in extreme conditions. This objective is achieved with solid training that allows you to critically use multiscale and multiphysics simulation tools and direct design choices toward optimized, reliable, and sustainable economic and environmental solutions.

Therefore, students of this track are required to attend a specific course on the mechanical behaviour of materials and finite element simulations, a course in computational fluid dynamics, and courses ranging from topological optimization to the monitoring of structures, from the use of "Machine Learning" for mechanical systems to the development of their digital twins.

Additionally, students are offered countless elective courses to deepen their skills in designing lightweight mechanical structures and components, bioinspired solutions, design for additive manufacturing (DfAM), reliability, and robust design, as well as a series of laboratories to develop application solutions related to the topics of the courses.

PRE-REQUISITES

No particular prerequisites are required for the student who opts for the Computational Mechanical Design track. However, good basic skills (in the mathematical-physical field), in-depth knowledge of materials and mechanical design principles are recommended, and the curiosity necessary to face and solve complex, interdisciplinary, and multidisciplinary design problems.

CM3 Computational Mechanical Design

LEARNING OUTCOMES

The mechanical engineer with a Computational Mechanical Design specialization is a professional figure with a very broad and transversal cultural background. The in-depth study of complementary subjects allows the engineer's cultural background to be completed and allows him to tackle complex design problems with advanced tools.

JOB OPPORTUNITIES

The transversality of the Computational Mechanical Design track allows students to find work in companies that develop or produce systems/products with a priority on accurate design aimed at optimized and sustainable design solutions, economically and environmentally. The skills acquired make the mechanical engineer who has followed this track an ideal figure to follow and manage the development of the product from concept to production.

PARTNER UNIVERSITIES

There are countless collaborations with the most prestigious international universities and companies. By way of example, we mention the universities where Computational Mechanical Design students have carried out their thesis in the last year: Korea Advanced Institute of Science and Technology (KAIST, Corea), Rheinisch-Westfälische Technische Hochschule Aachen (RWTH Aachen, Germany), Technische Universität München (TUM, Germany), Chalmers Tekniska Högskola (Chalmers, Sweden), École Polytechnique Fédérale de Lausanne (EPFL, Switzerland), Eidgenössische Technische Hochschule Zürich (ETH Zurich, Switzerland), and Technische Universiteit Delft (TU Delft, The Netherlands).

CM3 Computational Mechanical Design

1 YEAR COURSES
60 ECTS

45 ECTS

	ECTS
Energy Conversion Technologies and Industry Decarbonization	10
Advanced Dynamics of Mechanical Systems	10
Advanced Machine Design	10
Advanced Manufacturing Processes B	5
Production Management	5
Advanced Materials for Mechanical Engineering	5

15 ECTS

	ECTS
Mechanical Behaviour of Materials and Finite Element Simulation	10
Computational Fluid Dynamics - Fundamentals	5

CM3 Computational Mechanical Design

2 YEAR COURSES

40 ECTS + 20 ECTS Master's Thesis

20 ECTS

	ECTS
Measurements for Mechanical Engineering	5
Machine Learning for Mechanical Systems	5
Digital Twin for Health and Usage Monitoring	5
Topology Optimisation	5
Surface Modeling for Engineering Applications	5
Additive Manufacturing B	5
Materials and Simulation Tools for Sustainable Processes	5

5 ECTS

	ECTS
LAB - Structural Health and Usage Monitoring in Action	5
LAB - Destructive and Non-Destructive Testing of Composite Materials for Automotive Applications	5
LAB - Metamaterials and Metastructures	5
LAB - Prototyping of Bioinspired Solutions	5

CM3 Computational Mechanical Design

10 ECTS

	ECTS
Computational Fluid Dynamics - Advanced Methods and Applications	5
Bio-inspired Robotics	5
Functional Mechanical Design	5
Advanced Design of Machine Elements	5
Biomimetic Structure Design	5
Impact Engineering	5
Computational Fluid Dynamics - Experimental Assessment	5
Lightweight Design of Mechanical Structures - Composite Structures	5
Lightweight Design of Mechanical Structures - Fundamentals	5
Reliable and Resilent Design of Mechanical Systems	5
Structural Reliability for Aerospace and Mechanical Components	5
Additive Manufacturing for Space and Aerospace Applications	5

CM3 Computational Mechanical Design

	ECTS
Bio-Inspired Design and System Thinking	5
Intellectual Property and Patents in Innovation	5
Methods for Complex Shape Generation	5
Reverse Engineering	5
Creativity for Sustainable Design	5
Design and Analysis of Experiments	5
Digital Machining B	5
Geometry Assurance	5
Agile Innovation	5
High-Tech Startups: Creating and Scaling Up	5
Materials and Simulation Tools for Sustainable Processes	5
One (or more) of the above courses of 5 ECTS*	5

*one (or more) of the courses listed in the group for the selection of a maximum of 20 ECTS.

5 ECTS

	ECTS
Open Couse	5