

Master of Science in Mechanical Engineering

Propulsion and Power

CC1



Contacts



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Track description

Given the present and future energy scenarios, the need of reducing the environmental impact of propulsion and power generation devices and systems asks for a deep and rigorous understanding of these topics. The Propulsion and Power track focuses on fundamental topics and technologies of propulsion, power production and usage. Particular attention is paid to the fluid dynamics, energy, environmental and sustainability aspects.

The track aims to train engineers with in-depth knowledge of the operating principles of machines for the propulsion, generation and use of mechanical power.

As for Propulsion, technologies of internal combustion engines (for both automotive, marine and aeronautical applications), fuel cells and batteries will be addressed.

About the generation and use of mechanical power, strictly interconnected to electrical power and energy storage issues, turbomachinery (for compression devices and expanders) and engines (internal combustion, fuel cells) will be presented in depth.



Skills

Students will learn how to:

- design engines and turbomachines for propulsion and power applications
- operate propulsion and power devices
- manage installation and maintenance of engines, turbines, compressors, and power devices in general
- optimize propulsion and power devices
- develop tools for modeling engines and turbomachines
- study innovative solutions for propulsion and power
- applications with near-zero emissions and synthetic fuels (H₂, methanol, ammonia...), for waste heat recovery and energy storage



CC1: Core Courses

Course Title	YEAR	SEM	ECTS	ECTS GROUP
Energy Systems	1	1	10	10
Dynamics of Mechanical Systems	1	1	5	5
Machine Design	1	2	5	5
Advanced Manufacturing Processes B	1	1	5	5
Design and Management of Production Systems	1	2	10	10
Materials for Energy	1	1	5	5

CC1: Track Specific Courses

Course Title	YEAR	SEM	ECTS	ECTS GROUP
Internal Combustion Engines	1	2	10	10
Computational Fluid Dynamics	1	2	10	10
Advanced Measurement Techniques for Propulsion and Power	1	2	10	
Rotordynamics and Diagnostics A	1	1	10	
Finite Element Simulation for High Temperature Engineering Applications	1	1	10	
Turbomachinery A	2	1	10	15
Power Production from Renewable Energy	2	2	5	
Electrical Drives For Industry And Transport Applications	2	2	5	
Elective courses (Combustione e sicurezza, Design of Fluid Machines for Clean Power Generation B, Fluid Machines for Next Generation Power Systems, Fuel Cells and Batteries, Heat Transfer and Thermal Analysis, Advanced Materials for Propulsion and Power, Infrastructure for Electric Mobility, ...)	2	1-2	5	15
Lab course (Internal Combustion Engines: Design and Testing, Turbomachinery: Design and Testing, ...)	2	2	5	5

CC1: Master's Thesis

**Experimental
analysis of
turbomachinery
performances**

**CFD study on
turbomachines**

**CFD of fuel
injection,
combustion and
reacting flows
in i.c. engines**

**Innovative
internal
combustion
engines with
renewable fuels**

