CC1 Propulsion and Power

LEARNING OBJECTIVES

Present and future energy scenarios impose the need to reduce the environmental impact of propulsion and energy generation devices and systems. This action, which can no longer be postponed, requires a deep and rigorous understanding of many topics and a holistic approach to the problem.

The Propulsion and Power track focuses on fundamental issues and technologies as well as on in-depth knowledge of the operating principles of machines for propulsion, generation and use of mechanical power. Students will be guided in developing and autonomous management of projects related to power systems involving the sizing, design, selection, and use of power components.

Technologies related to internal combustion engines, fuel cells, batteries, and some components of marine and aeronautical engines will be studied. With regard to the generation and use of mechanical power, closely interconnected to electrical power, turbomachinery (compressors/pumps), and engines (turbines, internal combustion, fuel cells) dedicated to these particular applications will be explored. Particular attention is paid to fluid dynamics, energy, environmental and sustainability aspects.

A holistic and multidisciplinary approach is envisaged, also testified by the Joint Track with Energy Engineering.

PRE-REQUISITES

Students who choose the Propulsion and Power track are required to have a good background in thermodynamics, fluid mechanics, and fluid machines. Good skills in the mathematical-physical field are also recommended, as well as the curiosity necessary to tackle and solve complex and multidisciplinary problems.

CC1 Propulsion and Power

LEARNING OUTCOMES

The mechanical engineer specializing in Propulsion and Power is an expert with a very broad cultural background, especially in the world of energy, mechanical power generation, and propulsion in the automotive, naval, aeronautical, and off-road fields (agricultural machinery and earthmoving). The in-depth study of subjects related to energy problems, the sizing of elements of fluid machines, simulation and measurement of performance will allow them to address complex theoretical and applicative problems in broad traditional and innovative fields of propulsion, power generation, and classical mechanics as well.

JOB OPPORTUNITIES

The multidisciplinary nature of the Propulsion and Power track allows students to be employed in many companies active in the energy field working on design, production, commissioning and tests, management, and operation of propulsion and power systems as well as their key components like engines and turbomachinery. Furthermore, the common root of mechanical engineering also allows students to explore the basic mechanics fields.

PARTNER UNIVERSITIES

There are many collaborations with prestigious universities, research centres, and companies. By way of example, here are reported some locations where students of the Propulsion and Power track can do their thesis work: Technische Universität Graz (TU Graz, Austria), von Karman Institute for Fluid Dynamics (VKI, Belgium), Université d'Orléans (France), Universität Stuttgart (Germany), Universitat Politècnica de València (UPV, Spain), Technische Universiteit Delft (TU Delft, The Netherlands), and Technische Universiteit Eindhoven (TUe, The Netherlands).

CC1 Propulsion and Power

1 YEAR COURSES

60 ECTS

40 ECTS

	ECTS
Energy Systems	10
Dynamics of Mechanical Systems	5
Machine Design	5
Advanced Manufacturing Processes B	5
Design and Management of Production Systems	10
Materials for Energy	5

10 ECTS

	ECTS
Internal Combustion Engines	10

10 ECTS

	ECTS
Computational Fluid Dynamic	10
Rotordynamics and Diagnostics A	10
Advanced Measurement Techniques for Propulsion and Power	10
Finite Element Simulation for Mechanical Design	5
Mechanical Design for High Temperature Engineering Applications	5

CC1 Propulsion and Power

2 YEAR COURSES

40 ECTS + 20 ECTS Master's Thesis

15 ECTS

	ECTS
Turbomachinery A	10
Power Production from Renewable Energy	5
Electrical Drives for Industry and Transport Applications	5

5 ECTS

	ECTS
LAB - Internal Combustion Engines and Turbomachinery	5
LAB - Physis PEB	5

5 ECTS

	ECTS
Open Couse	5

CC1 Propulsion and Power

15 ECTS

	ECTS
Combustione e sicurezza	5
Heat Transfer and Thermal Analysis	5
Fuel Cells and Batteries	5
Machine Learning for Mechanical Systems	5
Noise and Vibration Engineering	5
Additive Manufacturing B	5
Advanced Materials for Propulsion and Power	5
Infrastructure for Electric Mobility	5
Intellectual Property and Patents in Innovation	5
Design and Construction of Automotive Electric Motors	5
Design of Fluid Machines for Clean Power Generation B	5
Non-Destructive Testing and Evaluation for Materials and Components	5
Structural Reliability for Aerospace and Mechanical Components	5
Failure Analysis, Sicurezza Industriale e Ingegneria Forense	5