

Master's degree in Research in Mechanical Engineering

TERRASSA SCHOOL OF INDUSTRIAL, AEROSPACE AND AUDIOVISUAL ENGINEERING (ESEIAAT)

BARCELONA SCHOOL OF INDUSTRIAL ENGINEERING (ETSEIB)

The master's degree in **Research in Mechanical Engineering** ([master's degree website](#)) aims to meet the needs of industry and research by producing highly qualified graduates who are equipped to carry out research in mechanical engineering in both academic (doctoral degrees and university staff positions) and non-academic contexts (RDI departments).

GENERAL DETAILS

Duration and start date

1 academic year, 60 ECTS credits. Starting September

Timetable and delivery

Face-to-face

Fees and grants

Approximate fees for the master's degree, **excluding other costs** (does not include non-teaching academic fees and issuing of the degree certificate):

€1,162 (€2,700 for non-EU residents).

[More information about fees and payment options](#)

[More information about grants and loans](#)

Language of instruction

Check the language of instruction for each subject in the course guide in the curriculum.

Information on [language use in the classroom and students' language rights](#).

Location

[Terrassa School of Industrial, Aerospace and Audiovisual Engineering \(ESEIAAT\)](#)

[Barcelona School of Industrial Engineering \(ETSEIB\)](#)

Official degree

[Recorded in the Ministry of Science, Innovation and Universities](#)

ADMISSION

General requirements

[Academic requirements for admission to master's degrees](#)

Specific requirements

Direct admission

The recommended entrance qualifications for the master's degree are those listed below. Holders of these qualifications are not required to take any bridging courses.

- Bachelor's degree in Industrial Engineering
- Pre-EHEA degree in Industrial Engineering
- Pre-EHEA diploma in Industrial Engineering
- Bachelor's degree in Physics
- Pre-EHEA degree in Physics

Bridging courses

For holders of qualifications other than those that provide direct admission, the academic committee of the master's degree will review each applicant's academic record to determine what bridging courses must be taken if the student is

admitted.

Students may be required to take bridging courses carrying between zero and 30 ECTS credits. Students who are required to take bridging courses that carry 15 or fewer ECTS credits must take them in the first semester of the master's degree. Students who are required to take bridging courses that carry more than 15 ECTS credits must take them before starting the master's degree.

Any bridging courses required will be subjects taught on bachelor's degrees in the industrial engineering field at the UPC.

New intake places

30

Pre-enrolment

Pre-enrolment period open.

Expected deadline: 01/07/2026.

[How to pre-enrol](#)

Enrolment

[How to enrol](#)

Legalisation of foreign documents

All documents issued in non-EU countries must be [legalised and bear the corresponding apostille](#).

CURRICULUM

Subjects	ECTS credits	Type
FIRST SEMESTER		
Advanced Fluid Mechanics	3	Compulsory
Advanced Heat Transfer	3	Compulsory
Advanced Structural Analysis	3	Compulsory
Computational Structural Dynamics	6	Compulsory
Introduction to Research Projects and Groups	3	Compulsory
Multibody System Dynamics	3	Compulsory
Acoustics	3	Optional
Advanced Engineering Data Analysis	3	Optional
Advanced Fluid Dynamic Design	5	Optional
Agile Methodologies and Processes for Innovative Solutions	3	Optional
Applications of Photonic Technologies	3	Optional
Biomechanics	4.5	Optional
Concrete Structures	5	Optional
Data Mining and Machine Learning for Engineers	3	Optional
Data Science	5	Optional
Design and Behaviour of Special Structures	3	Optional
Design, Ecodesign and Recycling	4.5	Optional
Dynamic Analysis of Structures	3	Optional
Experimental Mechanics of Advanced Materials and Structures	3	Optional
Experimental Techniques and Data Processing in Thermoenergetics	5	Optional
Flow Induced Vibration	3	Optional

Subjects	ECTS credits	Type
Further Heat Engines	4.5	Optional
Industrial Fluid Power	3	Optional
Integrated Manufacturing Systems	3	Optional
Internal Aerodynamics and Aeroelasticity of Turbomachines	5	Optional
IoT Engineering	3	Optional
Machine Design Methodology	4.5	Optional
Machine Technology	4.5	Optional
Machine Testing	4.5	Optional
Microfluids and Mems for Smart Sensors and Actuators	3	Optional
Parts Forming Systems	4.5	Optional
Proportional Hydraulics	3	Optional
Scientific Python for Engineers	3	Optional
Sensors and Communications	4.5	Optional
Turbulence: Phenomenology, Simulation and Aerodynamics	5	Optional
Master's Thesis	12	Project
SECOND SEMESTER		
Fundamentals of Fluid Mechanics	3	Optional
Generative Ai for Engineers: a Hands-On Approach	3	Optional
Research Group Placement	18	Optional
Technical Entrepreneurship	5	Optional
Turbulence I: Fundamentals, Simulation and Aerodynamics	3	Optional
Turbulence II: Advanced Simulation, Modelling and Aerodynamics	3	Optional
Urban Water Engineering and Management	3	Optional
PROFESSIONAL OPPORTUNITIES		

Professional opportunities

- Academic research in laboratories and research centres.
- Technological development and industrial research in RDI departments.
- Development areas of production companies working in highly technical areas, including areas related to the aerospace and automotive sectors.
- Trainee researcher (doctoral programmes).
- Head of RDI in companies involved in mechanical engineering.
- Specialist in RDI departments of companies in the field.

Competencies

Generic competencies

Generic competencies are the skills that graduates acquire regardless of the specific course or field of study. The generic competencies established by the UPC are capacity for innovation and entrepreneurship, sustainability and social commitment, teamwork, proper use of information resources, knowledge of a foreign language (preferably English) and gender perspective.

Specific competencies

- The ability to plan, calculate and design integrated manufacturing systems.
- The ability to use CAD/CAM/CAE, CFD numerical simulation and dynamic simulation tools for the design and advanced

calculation of fluid dynamics facilities and systems.

- The ability to analyse and formulate dynamic phenomena for application in the development of all phases of the conception, design, calculation and simulation of advanced mechanical elements.
- The ability to analyse advanced fluid dynamic, power transmission and advanced manufacturing processes for application in industrial facilities view of the product, production volume, and elements, machines and vehicles used.
- The ability to apply structural analysis, modelling and numerical simulation of structures under static and dynamic loads.
- The ability to apply the legislation, regulations and directives in effect and to assess the environmental, energy, social and ethical implications of research projects.
- The ability to use computational tools based on numerical methods for research in fluid dynamic design.
- The ability to apply knowledge of heat transfer processes to research related to the design and calculation of thermal equipment and applications.
- The ability to identify research trends in the area of mechanical engineering, different models for research units, funding channels for research projects, and RDI management and protection mechanisms.
- The ability to develop advanced computational tools in heat and mass transfer for the conception, design and optimisation of hydraulic thermal flow systems and equipment.
- The ability to use multibody system simulation tools for research related to the modelling, kinematics and dynamics of such systems.
- The ability to use computational tools based on numerical methods to conduct research in structural dynamics.
- The ability to conduct literature reviews to identify the state of the art in a particular topic area, to understand the process of scientific publishing and to write a cogent scientific document.
- The ability to carry out and present and defend before an examination committee an original, individual piece of work consisting of a comprehensive study or project, of a professional or research nature, that synthesises the competencies acquired on the degree.

QUALITY ACCREDITATION

Check the degree's main quality indicators in the University Studies in Catalonia portal of the Catalan University Quality Assurance Agency. Find information on topics such as degree evaluation results, student satisfaction and graduate employment data.

[Further information](#)

ACADEMIC ORGANISATION

UPC school

[Terrassa School of Industrial, Aerospace and Audiovisual Engineering \(ESEIAAT\)](#)
[Barcelona School of Industrial Engineering \(ETSEIB\)](#)

Academic coordinator

[Jordi Romeu](#)

Academic calendar

[General academic calendar for bachelor's, master's and doctoral degrees courses](#)

Academic regulations

[Academic regulations for master's degree courses at the UPC](#)

MASTER'S DEGREE WEBSITE
