

Master's degree in Research in Mechanical Engineering

The master's degree in **Research in Mechanical Engineering** 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

1.5 academic years, 90 ECTS credits. Starting September

Timetable and delivery

Face-to-face

Fees and grants

Approximate fees for the master's degree, excluding other costs, €2,490 (€3,735 for non-EU residents).

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

[More information about grants and loans](#)

Language of instruction

Subjects will be taught in Catalan, Spanish or English, depending on the student's level of comprehension and on the teaching objectives of the master's degree.

Official degree

Official degree.

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.

Places

30

Pre-enrolment

Pre-enrolment closed (consult the new pre-enrolment periods in the [academic calendar](#)).

[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](#).

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, knowledge of a foreign language (preferably English), teamwork and proper use of information resources.

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.

ORGANISATION: ACADEMIC CALENDAR AND REGULATIONS

UPC school

[Barcelona East School of Engineering \(EEBE\)](#)
[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](#)

CURRICULUM

Subjects	ECTS credits	Type
FIRST SEMESTER		
(Ang) Treball de Recerca	12	Optional
Acoustics	3	Optional
Advanced Manufacturing	6	Optional
Agile Methodologies and Processes for the Creation of Innovative Solutions	3	Optional
Computational Methods in Science and Engineering	6	Optional
Computational Structural Dynamics	5	Compulsory
Design and Behavior of Special Structures	3	Optional
Dynamic Analysis of Structures	3	Optional
Experimental Mechanics of Advanced Materials and Structures	3	Optional
Fluid Systems Design	5	Compulsory
Heat and Mass Transfer	5	Compulsory
Industrial Fluid Power	3	Optional
Introduction to Research Projects and Groups	3	Compulsory
Mechatronics	6	Optional
Multiscale Engineering Fluid Mechanics	6	Optional
Proportional Oil Hydraulics	3	Optional
Railway Systems	3	Optional
Simulation & Optimization	6	Optional
Systems Modeling	6	Optional
SECOND SEMESTER		
Microfluids and Mems for Smarts Sensors and Actuators	3	Optional

Subjects	ECTS credits	Type
Non Destructive Testing in Mechanical Engineering	7.5	Optional
THIRD SEMESTER		
Master's Thesis	18	Project

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