Master's degree in Interdisciplinary and Innovative Engineering

Today’s society demands breakthrough technologies in emerging areas such as energy management, digital industry and healthcare. Facing such challenges requires that interdisciplinary engineering teams work together to come up with creative, reliable, ethical and sustainable solutions.

One of the key factors in leading successful projects is for professionals from different areas to have strong skills in modern engineering methods such as big data, 3D printing, smart sensors and computer simulation. The **master's degree in Interdisciplinary and Innovative Engineering** (**master's degree website**) has been designed to enhance your academic background with such skills, thus preparing you for the future.

The specialisations will allow you to face real problems in three emerging areas of application: energy-efficient systems, smart factories and healthcare technologies. A research-oriented master’s thesis worth 30 ECTS credits will provide you with the opportunity to collaborate with R&D departments at companies, research centres and hospitals.

Specialisations

- Efficient Systems
- Advanced Manufacturing Systems
- Healthcare and Biomedical Applications

GENERAL DETAILS

Duration and start date

2 academic years, 120 ECTS credits. Starting September

Timetable and delivery

Afternoons. Face-to-face

Fees and grants

Approximate fees for the master’s degree, excluding other costs, €3,320 (€8,300 for non-EU residents).
More information about fees and payment options
More information about grants and loans

Language of instruction

English

Information on language use in the classroom and students’ language rights.

Location

Barcelona East School of Engineering (EEBE)

ADMISSION

General requirements

Academic requirements for admission to master's degrees

Specific requirements

To be admitted to the master’s degree, applicants must certify, at the time of enrolment, that they have a CEFR B2 level of English (at minimum).

Direct admission

It is recommended that applicants have a university-level qualification of a scientific-technical nature, that is, a bachelor's or pre-EHEA degree in engineering or sciences.

With bridging courses

On a case-by-case basis, the academic committee of the master's degree may consider admitting applicants who have completed qualifications other than those recommended. When such applicants are admitted, the academic committee will specify the bridging courses that must be completed. The bridging courses required may vary in view of the student's academic background but will be related to the following subjects:

- Electronics
- Programming
- Numerical methods

In any case, applicants will not be admitted if, based on their academic background, they would need to complete bridging courses carrying a total of more than 30 ECTS credits.

Admission criteria

- Academic record (60%)
- Correspondence between the competencies of the entrance qualification and those of the master's degree (40%)

Places

60

Pre-enrolment

Pre-enrolment period open.
Expected deadline: 26/06/2023.

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.

DOUBLE-DEGREE AGREEMENTS

With other international universities

- Master's degree in Interdisciplinary and Innovative Engineering (esp: Advanced Manufacturing Systems) / Laurea Magistrales in Ingegneria Informatica (esp: Artificial Intelligence and Human-Centred Computing; Logistics and Production; Networked Control Systems; Software and Computing Platforms). (Università di Genova. Italia)
- Master's degree in Interdisciplinary and Innovative Engineering (Area of Specialisation: Advanced Manufacturing Systems, Healthcare and Biomediacal applications) / Master's degree in Complex System Engineering (Area of Specialisation: Machine Learning and Optimization of complex Systems, Automation and Robotics for Intelligent systems, Mechatronic Systems, Biomechanics and bioengineering). (Université de Techonologie de Compiègne (UTC))
- Bachelor's degree EEBE (Biomedical, Electrial, Industrial Electronic and Automatic Control, Energy, Mechanical, Materials, Chemical) / Bs.C.Ecole Centrale + Master's degree EEBE (Advanced Materials Science and Engineering, Master in Interdisciplinary and Innovative Engineering, Chemical Engineering) (Ecole Centrale Lille - Centrale de Lyon - Ecole Centrale Marseille - Ecole Centrale de Nantes - CentraleSupélec - Francia)

PROFESSIONAL OPPORTUNITIES

Professional opportunities

- R&D centres
- Start-up companies
- Technology management and intellectual property
- Digital transformation projects
- eHealth applications
- Business intelligence
- Industry 4.0 and smart factories
- Sustainability management

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:

- Apply sensorisation, instrumentation and data acquisition technologies to characterise, monitor and control the status of systems, plants and processes.
- Apply techniques related to pattern recognition, artificial intelligence, and statistical data analysis so that decisions concerning problems of a multidisciplinary nature can be made in an objective, quantitative and reproducible way.
- Use appropriate computational techniques to simulate engineering-related physical phenomena, and adapt and apply optimisation algorithms to tackle engineering problems.
- Design and implement modelling techniques to describe the operation of systems, predict the stability of a system and apply control techniques in different scenarios.
- Apply predictive analytics to identify innovation risks and opportunities in different company areas and in the planning and management of projects aimed at creating new technological products and business models.
- Assess the sustainability of proposed technological solutions and associated risks in order to address problems objectively and quantitatively, and propose schemes that foster reuse of resources and support the circular economy.
- Catalogue and assess internal and external technologies (both mature and emerging), make proposals concerning how to manage them in a way that is aligned with company strategy, plan and manage RDI projects and follow procedures for obtaining public or private funding for such projects.
- Assess, quantify and manage the business risk associated with technical solutions adopted in engineering projects.
- Design, implement and manage automated systems for the control and supervision of processes in engineering.
- Design and implement image analysis systems for advanced characterisation of complex systems in engineering.
- Design and manage processing and management systems for the production, storage, conversion and distribution of electric power using different technologies (specific competency of the Efficient Systems specialisation).
- Design technical solutions that ensure responsible and sustainable management of materials used and reduce the associated environmental impact (specific competency of the Efficient Systems specialisation).
- Design industrial applications that use physical chemistry processes that optimise the efficiency and sustainability of systems (specific competency of the Efficient Systems specialisation).
- Design and manage production processes that include quality control systems based on advanced characterisation techniques (specific competency of the Advanced Manufacturing Systems specialisation).
- Design and implement procurement, operational and control systems that integrate electronic, electrical and mechanical technology in relation to intelligent production systems (specific competency of the Advanced Manufacturing Systems specialisation).
- Design systems for the monitoring, planning and control of automated industrial processes that allow for automated predictive maintenance based on detection and diagnosis of plant failures (specific competency of the Advanced Manufacturing Systems specialisation).
- Apply advanced techniques for the acquisition, processing, analysis and interpretation of biomedical signals in order to identify and monitor physiological biomarkers in the diagnostic process (specific competency of the Healthcare and Biomedical Applications specialisation).
- Use software tools for design, modelling and computational simulation to design innovative solutions in biomedicine (specific competency of the Healthcare and Biomedical Applications specialisation).
- Develop translational applications aimed at gaining a better understanding of physiological phenomena of clinical relevance, and design new applications in areas that have an impact on healthcare (specific competency of the Healthcare and Biomedical Applications specialisation).
- Produce, document, and present and defend before an examination committee, an original work consisting of an individual or group project of an interdisciplinary nature that draws on and integrates the competencies acquired on the master's degree.

ORGANISATION: ACADEMIC CALENDAR AND REGULATIONS

UPC school

Barcelona East School of Engineering (EEBE)

Academic coordinator

Raul Benítez

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			
Data Acquisition & Instrumentation		6	Compulsory
Data Analysis & Pattern Recognition		6	Compulsory
Simulation & Optimization		6	Compulsory
Systems Modeling		6	Compulsory
Technology Innovation		6	Compulsory
Specialisation in Specialisation in Advanced Manufacturing Systems	Data Acquisition & Instrumentation	6	Compulsory
	Data Analysis & Pattern Recognition	6	Compulsory
	Simulation & Optimization	6	Compulsory
	Systems Modeling	6	Compulsory
	Technology Innovation	6	Compulsory
Specialisation in Specialisation in Efficient Systems	Data Acquisition & Instrumentation	6	Compulsory
	Data Analysis & Pattern Recognition	6	Compulsory
	Simulation & Optimization	6	Compulsory
	Systems Modeling	6	Compulsory
	Technology Innovation	6	Compulsory
Specialisation in Specialisation in Healthcare and Biomedical Applications	Data Acquisition & Instrumentation	6	Compulsory
	Data Analysis & Pattern Recognition	6	Compulsory
	Simulation & Optimization	6	Compulsory
	Systems Modeling	6	Compulsory
	Technology Innovation	6	Compulsory
SECOND SEMESTER			
Computer Vision		6	Compulsory
Control Systems		6	Compulsory
Management of Technology		6	Compulsory
Risk Analysis		6	Compulsory
Sustainability & Circular Economy		6	Compulsory

Subjects		ECTS credits	Type
Specialisation in Specialisation in Advanced Manufacturing Systems	Computer Vision	6	Compulsory
	Control Systems	6	Compulsory
	Management of Technology	6	Compulsory
	Risk Analysis	6	Compulsory
	Sustainability & Circular Economy	6	Compulsory
Specialisation in Specialisation in Efficient Systems	Computer Vision	6	Compulsory
	Control Systems	6	Compulsory
	Management of Technology	6	Compulsory
	Risk Analysis	6	Compulsory
	Sustainability & Circular Economy	6	Compulsory
Specialisation in Specialisation in Healthcare and Biomedical Applications	Computer Vision	6	Compulsory
	Control Systems	6	Compulsory
	Management of Technology	6	Compulsory
	Risk Analysis	6	Compulsory
	Sustainability & Circular Economy	6	Compulsory
THIRD SEMESTER			
Specialisation in Specialisation in Advanced Manufacturing Systems	Advanced Manufacturing	6	Optional
	Biofunctional Materials	6	Optional
	Bioinformatics	6	Optional
	Biomechanics Modelling	6	Optional
	Biomedical Signal Analysis	6	Optional
	Electrical Energy Processing	6	Optional
	Electron Beam Applications	6	Optional
	Fuel Cells	6	Optional
	Iot Sensors & Mems	6	Optional
	Mechatronics	6	Optional
	Plant Monitoring & Fault Detection	6	Optional
	Renewable Energy Systems	6	Optional
	Robotic Systems	6	Optional
	Sustainable Materials	6	Optional
	Wearable Devices	6	Optional

Subjects		ECTS credits	Type
Specialisation in Specialisation in Efficient Systems	Advanced Manufacturing	6	Optional
	Biofunctional Materials	6	Optional
	Bioinformatics	6	Optional
	Biomechanics Modelling	6	Optional
	Biomedical Signal Analysis	6	Optional
	Electrical Energy Processing	6	Optional
	Electron Beam Applications	6	Optional
	Fuel Cells	6	Optional
	Iot Sensors & Mems	6	Optional
	Mechatronics	6	Optional
	Plant Monitoring & Fault Detection	6	Optional
	Renewable Energy Systems	6	Optional
	Robotic Systems	6	Optional
	Sustainable Materials	6	Optional
	Wearable Devices	6	Optional
Specialisation in Specialisation in Healthcare and Biomedical Applications	Advanced Manufacturing	6	Optional
	Biofunctional Materials	6	Optional
	Bioinformatics	6	Optional
	Biomechanics Modelling	6	Optional
	Biomedical Signal Analysis	6	Optional
	Electrical Energy Processing	6	Optional
	Electron Beam Applications	6	Optional
	Fuel Cells	6	Optional
	Iot Sensors & Mems	6	Optional
	Mechatronics	6	Optional
	Plant Monitoring & Fault Detection	6	Optional
	Renewable Energy Systems	6	Optional
	Robotic Systems	6	Optional
	Sustainable Materials	6	Optional
	Wearable Devices	6	Optional
FOURTH SEMESTER			
Master's Thesis		30	Project
Specialisation in Specialisation in Advanced Manufacturing Systems	Master's Thesis	30	Project
Specialisation in Specialisation in Efficient Systems	Master's Thesis	30	Project
Specialisation in Specialisation in Healthcare and Biomedical Applications	Master's Thesis	30	Project