

MASTER'S DEGREE IN COMPUTATIONAL AND DATA-ASSISTED ENGINEERING

ETSECCPB

Barcelona School of Civil Engineering



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

MASTER'S DEGREE IN COMPUTATIONAL AND DATA-ASSISTED ENGINEERING

The master's degree in Computational and Data-Assisted Engineering provides comprehensive interdisciplinary education in the fields of computational engineering and data science by means of simulation, data analysis and machine learning in industrial and scientific environments.

The aim of the programme is to produce professionals who are able to solve complex challenges through numerical simulation and machine learning in modelling, in an environment linked to world-class research centres such as the International Centre for Numerical Methods in Engineering (CIMNE) and the Mathematical and Computational Modelling Laboratory (LACAN). The programme trains students in the practical use of advanced computational tools for solving complex problems by developing new computational methods and data-driven solutions, and delves into the use of innovative technologies such as machine learning and big data processing.

Curriculum

This information may be subject to modifications.
Up-to-date information at: upc.edu

90 ECTS
credits

1st year

1st semester

Mechanics of Continuum	5
Introduction to Computational Methods	5
Partial Differential Equations and Finite Element Method	5
Scientific Programming and High Performance Computing	5
Applied Statistics and Uncertainty Quantification	5
Ethics & Communication in Science and Engineering	5

2nd semester

Computational Mechanics of Solids and Structures	5
Computational Fluid Dynamics	5
Optimization	5
Machine Learning and Artificial Intelligence	5
Laboratory of Computational Mechanics Projects	5
Data-based Projects Laboratory	5

2nd year

3rd semester

Coupled Problems	5
Data-Assisted Engineering and Reduced Order Modeling	5
Computational Modeling of Materials	5
External Placement	15
Master's Thesis	15

 Compulsory Subjects

 Optional Subjects

+100

PhD's trained in the previous edition of the program

International double degrees

Support from the CIMNE and LACAN, world-renowned research centres

Why this master's degree?

The master's degree in Computational and Data-Assisted Engineering (CODE) draws on the experience of the prestigious master's degree in Numerical Methods in Engineering and adapts the curriculum to current engineering challenges. The programme responds to the industry's need for graduates with professional engineering qualifications and expertise in the fields of traditional physical simulation (finite elements) and data-based technologies (machine learning, big data, etc.).

With a study load of 90 ECTS credits and lasting one and a half academic years, it is designed to offer a hybrid and modern perspective from which to address multidisciplinary problems that cannot be solved by traditional analytical methods.

Student admissions and background

The programme is aimed at graduates of bachelor's degrees who have had multidisciplinary training in the fields of mechanical, civil, informatics or industrial engineering or in mathematical or physical sciences.

Teaching methods

The master's degree has an eminently practical curriculum that is oriented towards research and industrial innovation and is based on the following teaching methods:

- Challenge- and problem-based learning: solving real engineering problems using advanced simulation and data analysis software.
- Practical education: intensive sessions on the use of calculation and programming tools in specialised laboratories.

- Flipped classroom: incorporation of participatory dynamics to consolidate theoretical content through practice in the classroom.
- Connection to research centres: access to the CIMNE (Severo Ochoa Centre of Excellence) ecosystem and LACAN.

Teaching

Teaching takes place online. Classes are taught in English in an international setting geared towards graduates' employment in a globalised labour market.

Professional opportunities

Once you graduate, your professional career may be focused on one of the following areas:

- Design and optimisation of products and processes using computer simulation and predictive models.
- Integration of artificial intelligence techniques in solving problems in physics and engineering (digital twins).
- Development of new numerical methods and algorithms for Industry 4.0.
- Leadership of R&D projects in high tech sectors.

Graduates profile

Demand for graduates of this degree is very high across a range of sectors:

- Civil engineering: design and analysis of structural components for optimising infrastructure.
- Industrial and mechanical engineering: optimisation of industrial processes and design of new components.
- Automotive and aerospace industry: design of components in the field of aerodynamics and new materials.
- Technology consulting: data analysis and simulation for strategic decision making.

- Academic research: access to research careers through internationally renowned doctoral programmes.

Master's thesis

You will work on a comprehensive innovation, synthesis or document research project that integrates the skills you have acquired. You may carry out innovation projects or projects implementing new technologies or research lines that are often linked to real research projects and the needs of technology companies.

Double-degree agreements

You can pursue a double degree through the agreements in place with top-tier European universities such as the University of Stuttgart (Germany), the Università di Padova (Italy) and Swansea University (United Kingdom).

International standing

With a strong international focus, the master's degree benefits from the strategic support of the International Centre for Numerical Methods in Engineering (CIMNE), recognised as a Severo Ochoa Centre of Excellence, and the Mathematical and Computational Modelling Laboratory (LACAN). The School's teaching staff have received national and international awards and distinctions for their teaching and research, and this contributes to the School's position in international rankings such as the QS World University Rankings by Subject and the NTU Ranking, which position the UPC as the top university in Spain in Civil Engineering and the tenth best European university.

MASTER'S DEGREE IN COMPUTATIONAL AND DATA-ASSISTED ENGINEERING

The Barcelona School of Civil Engineering (ETSECCPB) is a university school that is an international benchmark in civil, geological and environmental engineering because of the quality of its teaching and high-level research. It is the only school in Catalonia that offers degrees in Civil Engineering, and it has a strong international focus.

The ETSECCPB belongs to the Universitat Politècnica de Catalunya - BarcelonaTech (UPC), a renowned public institution of research and higher education in the fields of engineering, architecture, sciences and technology. With 50 years of history and more than 30,000 students, the UPC has the greatest concentration of research and technological innovation in southern Europe. It is the best university in Spain in Civil and Structural Engineering, according to the 2024 QS World University Rankings by Subject.



Your talent, our commitment to the future

Further information:

camins.upc.edu/en/studies

admissions.masters.camins@upc.edu

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