

Master's degree in Numerical Methods in Engineering

The **master's degree in Numerical Methods in Engineering** ([master's degree website](#)) provides multidisciplinary training in computational mechanics in view of the growing demand for accurate and reliable numerical simulations. It aims to produce specialists in the theory and applications of calculation methods for product and process design, in the widest possible sense. Graduates will immediately be able to apply the knowledge acquired in industry. Their solid scientific training will also enable them to pursue a doctoral degree.

GENERAL DETAILS

Duration and start date

2 academic year, 120 ECTS credits. Starting September

Timetable and delivery

Mornings and afternoons. Face-to-face and distance

Fees and grants

Approximate fees for the master's degree, excluding other costs, €5,533 (€8,300 for non-EU residents).

This master's degree was selected in the Masters of Excellence grant programme of the Catalunya-La Pedrera Foundation. More information is available at the [Foundation's website](#).

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

[More information about grants and loans](#)

Language of instruction

English

Location

[The course will be taught at the School of Civil Engineering of Barcelona \(ETSECCPB\).](#)

Official degree

[Recorded in the Ministry of Education's degree register](#)

ADMISSION

General requirements

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

Specific requirements

This master's degree is aimed at graduates of degrees in Engineering, Mathematics or Physical Sciences who want to focus on the world of multidisciplinary engineering. Ideal candidates will have a solid basic education and an interest in working in the sphere of engineering consultancy.

Admission criteria

Admission will be subject to approval by the Teaching Committee of the Master's Degree and the applicant's academic record.

Places

25

Pre-enrolment

Pre-enrolment period open.
Expected deadline: 06/07/2021.

[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

The course addresses real educational needs in Europe and worldwide. Computational mechanics is set to become even more multidisciplinary than in the past, and it is expected that in the coming decade the demand for accurate and reliable numerical simulation of engineering systems will undergo explosive growth and have a major impact on our everyday lives. Graduates of this master's degree will be experts in numerical methods in engineering. They will be professionals able to put into practice the acquired knowledge directly to industry and they will also have the necessary scientific background to undertake a doctoral degree successfully.

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 skills

On completing this master's degree, students will be able to:

- Solve problems using numerical and computational methods, having completed and consolidated their basic training in this field and reinforced their knowledge of the basic elements and specific applications.
- Understand and master the theories and applications of numerical methods for solving engineering problems.
- Apply, based on their experience and a critical approach, numerical methods through the use of calculation programs, graphics pre- and post-processors, programming language and scientific calculation libraries.
- Come up with conventional solutions based on consolidated knowledge, criteria and critical thinking, and analyse results for problems that are characteristic of numerical modelling.
- Show knowledge of and acquire critical awareness of the European Union and the international vanguard in the use of numerical methods in engineering.
- Strengthen skills for solving real engineering problems through numerical modelling, using the identification of the underlying mathematical model, the most appropriate method of calculation and the critical interpretation of the results.
- Independently use their knowledge and understanding of computational engineering to design solutions to new or unfamiliar problems, incorporating knowledge gained and knowing how to use the theory and practices of other disciplines, where appropriate, and designing new, original problem-solving methods that are suited to the objectives.
- Understand the applicability and the limitations of numerical modelling and existing calculation technologies.
- Independently and expertly look for, filter, collect and synthesise ground-breaking scientific and technical information.
- Be familiar with advanced numerical modelling applied to various areas of engineering: civil, environmental, mechanical, aerospace, nanoengineering and bioengineering.
- Apply the latest numerical technologies to solving basic problems (*numerical linear algebra*, optimisation, etc.).

- Show knowledge of the modern physical models of materials science (advanced constitutive models) in solid and fluid mechanics.
- Use and have knowledge of quality control techniques for numerical simulation (validation and verification).
- Use modern numerical simulation tools competently and apply them to the typical problems of multidisciplinary engineering.
- Understand the applicability and the limitations of the different numerical simulation techniques.
- Use existing calculation programs and preprocessors and postprocessors and show knowledge of programming languages and standard calculation libraries.

ORGANISATION: ACADEMIC CALENDAR AND REGULATIONS

UPC school

[Barcelona School of Civil Engineering \(ETSECCPB\)](#)

Academic coordinator

[Riccardo Rossi](#)

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		
Advanced Fluid Mechanics	5	Compulsory
Communication Skills 1	5	Compulsory
Computational Mechanics Tools	5	Compulsory
Continuum Mechanics	5	Compulsory
Finite Element	5	Compulsory
Numerical Methods for Pdes	5	Compulsory
SECOND SEMESTER		
Computational Solid Mechanics	5	Compulsory
Computational Structural Mechanics and Dynamics	5	Compulsory
Coupled Problems	5	Optional
Domain Descomposition and Large Scale Scientific Computing	5	Compulsory
Finite Elements in Fluids	5	Compulsory
Programming for Engineers and Scientists	5	Optional
THIRD SEMESTER		
Advanced Discretization Methods	5	Optional
Communication Skills 2	5	Compulsory
Entrepreneurship	5	Compulsory
Industrial Training	15	Compulsory

Subjects	ECTS credits	Type
FOURTH SEMESTER		
Master's Thesis	30	Project

June 2021. [UPC](#). Universitat Politècnica de Catalunya · BarcelonaTech