UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

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** (does not include non-teaching academic fees and issuing of the degree certificate):
€3,320 (€12,662 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

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: 01/07/2024.

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

Double-degree pathways with foreign universities

- Master in Numerical Methods in Engineering (ETSECCPB) + Master's degree (Laurea Magistrale) in Mathematical Engineering-Padova (Scuola di Ingegneria, Università degli Studi di Padova, Padova, Italy)
- Master in Numerical Methods in Engineering (ETSECCPB) + Master in Computational Mechanics (Swansea University (USWAN) (Prifysgol Abertawe, Swansea, Gales, UK)
- Master in Numerical Methods in Engineering (ETSECCPB) + Master in Computational Mechanics of Materials and Structures (COMMAS) (Facultät 2: Bau-und Umweltingenieur-wissenschaften, Universität Stturgart, Sttutgard, Germany)
- Master in Numerical Methods in Engineering (ETSECCPB) + Master in Computational Mechanics (Ecole Centrale de Nantes, Nantes, France)

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

Alberto García González

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