Erasmus Mundus master's degree in Computational Mechanics

The Erasmus Mundus master's degree in Computational Mechanics is designed for students who wish to develop their knowledge and competency in the field of computational mechanics with applications in solids, fluids and interdisciplinary fields. The goal is to provide them with the skills needed for modelling, formulating, analysing and implementing simulation tools for advanced engineering problems, as well as skills for understanding these approaches in the broader context of engineering science. An entrepreneurial component complements these skills, providing students with tools for setting up successful businesses and enhancing their own employability.

This master's degree has received the International Master's Programme distinction (2013 call) awarded by the Government of Catalonia’s Agency for the Management of University and Research Grants (AGAUR).

This master’s degree is organised by an international consortium of five leading universities in cooperation with the International Centre for Numerical Methods in Engineering (CIMNE): Swansea University (UK), Ecole Centrale Nantes (France), Universität Stuttgart (Germany), Tsinghua University (China) and the UPC.

GENERAL DETAILS

Duration and start date
Two academic years, 120 ECTS credits. Starting September

Timetable and delivery
Mornings and afternoons. Face-to-face

Fees and grants
The Erasmus Mundus Masters fees are determined by the University Consortium that organizes the studies. These fees are the same for all the participant universities. For more information, please do not hesitate to contact the master web site.

Language of instruction
English

Official degree
Recorded in the Ministry of Education's degree register

ADMISSION

General requirements
Academic requirements for admission to master's degrees

Specific requirements
A degree in engineering or in applied mathematics, physics or a similar science-based subject

Admission criteria
The degree classification, class rank and full academic transcript, letters of recommendation, a statement of purpose (describing the applicant's interest in Computational Mechanics, their personal aims in this field and their preferred areas of specialisation), and a complete CV
Candidates will apply through a single point of entry: the web-based online application at the CIMNE Virtual Centre hosting a single application form. They will be required to hold a degree in engineering or in applied mathematics, physics or a similar science-based subject. Candidates whose first language is not English will be required to prove English language competency via a minimum IELTS score of 6.5 or an equivalent internationally recognised qualification.

**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.

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**PROFESSIONAL OPPORTUNITIES**

**Professional opportunities**

The field of Computational Mechanics is constantly growing within European industry. Cutting-edge technological advancements depend upon the implementation and use of advanced computational simulation tools. This consistent expansion is reflected in an increasing demand for highly qualified professionals within this field. The strength of this master's degree can be measured by the graduate employment rate in leading R&D departments in industry (55%) and the number of graduates continuing their education on doctoral programmes related to Computational Mechanics (40%).

**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:

- Complete and consolidate their basic training in problem-solving with numerical and computational methods.
- Attain advanced knowledge of the theory and application of numerical methods to the solution of engineering problems.
- Apply numerical methods using calculation programs, graphics pre- and post-processors, programming languages and calculation libraries.
- Complete and consolidate knowledge, criteria and critical thinking to come up with conventional solutions and analyse results in problems that are characteristic of numerical modelling.
- Acquire a critical awareness of the European Union and international vanguard in the use of numerical methods in engineering.
- Solve real engineering problems by 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 problems, incorporating theoretical and practical knowledge, from other disciplines where appropriate, and designing new, original and suitable problem-solving methods.
- Understand the applicability and the limitations of numerical modelling and existing calculation technologies.
- Attain knowledge of advanced numerical modelling and apply it to the different areas of engineering.
- Show knowledge of the latest numerical technologies for solving basic problems and also of the modern physical models of materials science.
- Learn and apply quality control techniques for numerical simulation using modern tools.
- Understand the applicability and the limitations of the different numerical simulation techniques and receive training in calculation methods: pre- and post-processing programs, programming languages and standard calculation libraries.

**ORGANISATION**

**European programme**
Erasmus Mundus

**UPC school**
Barcelona School of Civil Engineering (ETSECCPB)

**Participating institutions**
- Universitat Politècnica de Catalunya (UPC) - Coordinating university
- École Central de Nantes (France)
- Swansea University (United Kingdom)
- Tsinghua University (China)
- Universität Stuttgart (Germany)

**Academic coordinator**
Pedro Díez

**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**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>ECTS credits</th>
<th>Type</th>
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<tbody>
<tr>
<td><strong>FIRST SEMESTER</strong></td>
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<tr>
<td>Advanced Discretization Methods</td>
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<td>Advanced Fluid Mechanics</td>
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<tr>
<td>Communication Skills 1</td>
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<td>Communication Skills 2</td>
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<td>Computational Mechanics Tools</td>
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<td>Continuum Mechanics</td>
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<tr>
<td>Entrepreneurship</td>
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<td>Optional</td>
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<tr>
<td>Finite Element</td>
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<td>Compulsory</td>
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<tr>
<td>Numerical Methods for Pdes</td>
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<tr>
<td><strong>SECOND SEMESTER</strong></td>
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<tr>
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<td>Computational Structural Mechanics and Dynamics</td>
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<td>Coupled Problems</td>
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<td>Domain Descomposition and Large Scale Scientific Computing</td>
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<tr>
<td>Finite Elements in Fluids</td>
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<tr>
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<tr>
<td>Master's Thesis</td>
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<td>Project</td>
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