



# master of science in Computational Mechanics

**Erasmus Mundus  
Master Course**  
Starts yearly in  
October

A joint initiative of:

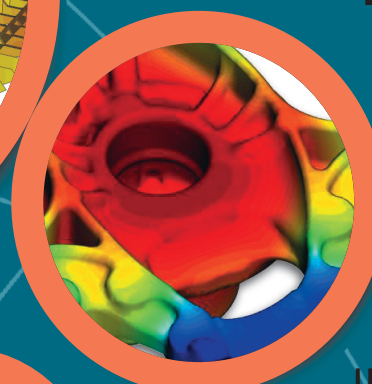
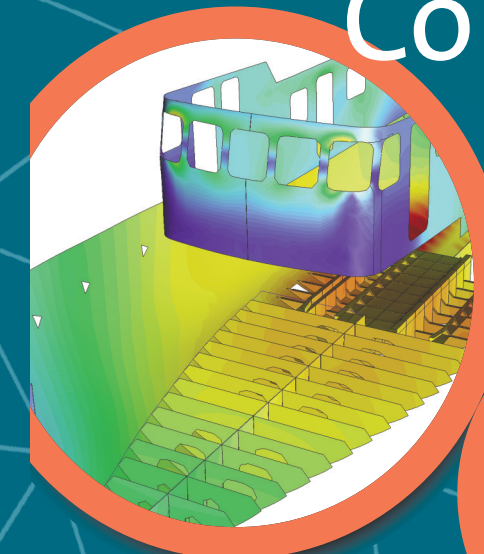
**UNIVERSITAT POLITÈCNICA  
DE CATALUNYA (BARCELONA, SPAIN)**

**SWANSEA UNIVERSITY (UK)**

**ECOLE CENTRALE NANTES (FRANCE)**

**UNIVERSITÄT STUTTART (GERMANY)**

In cooperation with CIMNE  
[www.cimne.com/cm-master](http://www.cimne.com/cm-master)



## Course lecturers

### UNIVERSITAT POLITÈCNICA DE CATALUNYA

- Prof. Carlos Agelet De Saracibar
- Dr. Irene Arias
- Dr. Marino Arroyo
- Prof. Alex Barbat
- Prof. Gabriel Bugeda
- Prof. Miguel Cervera
- Prof. Ramon Codina
- Dr. Michele Chiumenti
- Prof. Pedro Diez
- Dr. Sonia Fernandez-Méndez
- Dr. Roberto Flores
- Prof. Antonio Gens
- Prof. Antonio Huerta
- Prof. Sergio Idelsohn
- Dr. Javier Mora
- Prof. Xavier Oliver
- Prof. Sergio Oller
- Prof. Eugenio Oñate
- Dr. N'ria Parés
- Dr. Augustí Pérez-Foguet
- Dr. Antonio Rodríguez-Ferran
- Dr. Ricardo Rossi
- Dr. José Sarrate
- Dr. Yolanda Vidal
- Dr. Francisco Z-rate

### SWANSEA UNIVERSITY

- Prof. Sondipon Adhikari
- Prof. Javier Bonet
- Prof. Mark Cross
- Dr. E. De Souza Neto
- Dr. Wulf Dettmer
- Dr. M.G. Edwards
- Dr. Y. Feng
- Dr. Antonio Gil
- Dr. Colin Hayes
- Dr. Stephen John Hardy
- Prof. Oubay Hassan
- Dr. Paul Ledger
- Prof. Arthur W. Lees
- Prof. Roland W. Lewis
- Dr. Ian Masters
- Dr. Andrew McCowen
- Prof. Kenneth Morgan
- Dr. Perumal Nithiarasu
- Dr. Antonio Orlando
- Prof. D. Roger J. Owen
- Prof. Djordje Peric
- Dr. Rajesh S. Ransing
- Dr. Igor Sazanov
- Dr. Johann Sienz
- Prof. Nigel P. Weatherill
- Dr. R.Y. Xiao

### ECOLE CENTRALE NANTES

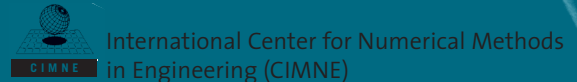
- Prof. Patrice Cartraud
- Dr Nicolas Chevaugnon
- Prof. Frédéric Dufour
- Prof. Laurent Gornet
- Dr Alban Leroyer
- Dr Steven Le Corre
- Prof. Ahmed Loukili
- Prof. Nicolas Moïs
- Prof. Gilles Pijaudier-Cabot
- Prof. Jean Piquet
- Prof. Arnaud Poitou
- Prof. Erwan Verron
- Prof. Michel Visonneau

### UNIVERSITÄT STUTTART

- Prof. Peter Bastian
- Prof. Manfred Bischoff
- Prof. Peter Eberhard
- Prof. Wolfgang Ehlers
- Prof. Rolf Eligehausen
- Prof. Lothar Gaul
- Prof. Christoph Gehlen
- Prof. Rainer Helmig
- Prof. Bernd Krüppin
- Prof. Christian Miehe
- Prof. Josko Ozbolt
- Prof. Ekkehard Ramm
- Prof. Siegfried Schmauder
- Prof. Peter Vermeer
- Prof. Barbara Wohlmuth

The course lecturers' list will be periodically updated and published in the Master's web site.

## Master's Secretariat



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08034 Barcelona, Spain  
Tel. + 34 -93 401 74 41, Fax + 34 -94 401 65 17  
e-mail: [science@cimne.upc.edu](mailto:science@cimne.upc.edu)

[www.cimne.com/cm-master](http://www.cimne.com/cm-master)

## Course material

The course material includes lecture notes and some textbooks. A collection of examples and exercises will be provided as well as computer codes for introducing students to the finite element method in practical applications. Online study utilities and tutorials will be provided by the E-Learning Center developed by CIMNE ([www.cimne.com/cdl](http://www.cimne.com/cdl)).

## Admission Requirements

A candidate must hold a Bachelor of Science or Engineering, or an appropriate science degree deemed to be a satisfactory standard for the purpose of postgraduate admission and awarded by an institution recognized by one of the members of the consortium. Applications must include a statement of purpose (one/two pages), a CV, complete academic transcripts and three letters of recommendation. A score of at least 6.5 IELTS (or equivalent TOEFL or TOEIC) is required for students from non-English speaking countries.

Students should check visa requirements at both the Spanish and British embassies.

A maximum of 60 students per year are admitted. Students are distributed evenly between partners on a merit-basis.

## Application process (via web)

<http://www.cimne.com/cm-master>  
For further questions please contact the master's Secretariat ([science@cimne.upc.edu](mailto:science@cimne.upc.edu))

## Tuition fees

16 000 € for third-country students and 8 000 € for others. (orientative fee, please refer to the web page for actual fees).

## Financial support

The European Commission offers scholarships to third-country students up to 42000€ through the Erasmus Mundus Action 2. In addition, a limited number of grants offering total or partial support to cover the course tuition fees are available. Details of the grant selection procedure can be found in the Master's web page.

## Payment methods

Payment can be made by cheque, bank transfer or credit card. For details visit the Master's web page. [www.cimne.com/cm-master](http://www.cimne.com/cm-master)



Barcelona



Nantes



Swansea



Stuttgart





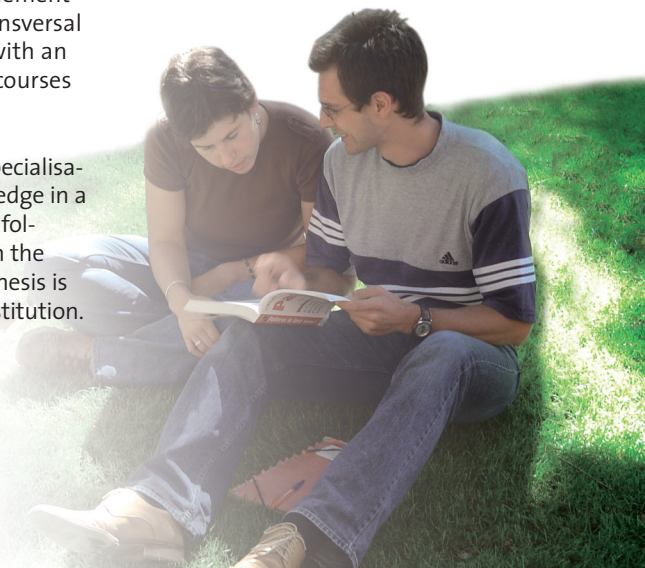


## Presentation

The Master of Science in Computational Mechanics supported by the European Commission through the Erasmus Mundus Programme 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 programme includes a component of entrepreneurship and innovation. The goal is to provide the students with the skills for the modelling, formulation, analysis and implementation of simulation tools for advanced engineering problems, as well as skills for understanding these approaches in the broader context of business and innovation. Students will benefit from a leading group of academics and an exciting international environment. Students may take the Master's as a professional terminal degree, or in preparation for a PhD degree.

## Curriculum

The programme lasts two academic courses (120 ECTS) and includes the Master Thesis as well as practical training in an industrial or applied research environment. The first part is aimed at providing a solid background on mechanics and numerical methods. It consists of a set of core courses (25 ECTS) complemented by elective courses (15 ECTS) and transversal modules (5 ECTS). The first part closes with an practical training at industry. The core courses are taught jointly at UPC and Swansea University. The second part (60 ECTS) consists of specialisation aimed at providing a deeper knowledge in a selected area. The second term must be followed in a 2nd institution different from the selected for the first term. The Master Thesis is supervised and developed in the 2nd institution.



## Organizers

An international consortium of four leading European Universities in cooperation with the International Center for Numerical Methods in Engineering (CIMNE). All institutions of the consortium have a long standing tradition in the field of Computational Mechanics, with the highest standards both in research and teaching.

UNIVERSITAT POLITÈCNICA DE CATALUNYA (UPC), BARCELONA, SPAIN  
www.upc.edu

SWANSEA UNIVERSITY (SU), UK  
www.swansea.ac.uk

ECOLE CENTRALE NANTES (ECN), FRANCE  
www.ec-nantes.fr

UNIVERSITÄT STUTTGART, GERMANY  
www.uni-stuttgart.de

CIMNE is an autonomous international research organization specialized in the development and application of numerical methods in engineering (www.cimne.com).

The entire Master Programme is taught in English.

Part I		Part II	
Core modules 25 ECTS	Advanced modules 15 ECTS	Modules 25 ECTS	Master thesis 30 ECTS
Transversal 5 ECTS	Industrial placement 15 ECTS	Transversal 5 ECTS	

The European Credit Transfer System (ECTS) is a student centered system based on the student workload required to achieve the objectives of a program, objectives specified in terms of learning outcomes and competences to be acquired.

The **first term** is simultaneously taught at Barcelona and Swansea, with identical core courses and a unified evaluation. Students can select to follow the first term either at UPC or UWS.

The core courses are listed below.

- Numerical Methods for Partial Differential Equations (5 ECTS)
- Finite Element Method (5 ECTS)
- Continuum Mechanics (5 ECTS)
- Advanced Fluid Dynamics (5 ECTS)
- Entrepreneurship for Engineers (5 ECTS)

The **second part** can be pursued at any of the four partner institutions different from the selected for the first term. It is organized in minors, consisting of a set of courses emphasizing, or bearing particular relevance to, a specific area in Computational Mechanics

Institution	First part 60 ECTS	Second part 60 ECTS				
		Solids Mechanics	Structural Engineering	Fluid Mechanics	Engineering Hydrodynamics	Engineering Materials
UPC/CIMNE	•	•		•		
SWANSEA U.	•		•	•		
EC NANTES			•		•	
U. STUTTGART		•				•

Courses	Master thesis and practical training
Electives modules include a breadth of specific topics, industrially or academically oriented, by experts among our faculty, as well as practical courses on modern computational methods pre/post-processing software, optimizations and programming among others.	Students will carry out their <b>Master Thesis</b> (30 ECTS) in the same institution where they take their second part, so that they can choose a topic related to one of their areas of specialization. The content of the Thesis can be oriented toward a research interest or else have an applied character. Students are allowed and encouraged to complete their thesis at their earliest convenience, but must submit this work before September of the last year programme.
A <b>entrepreneurship</b> module provides direct exposure to cross-disciplinary topics and the workings of an entrepreneurial economy. Students will develop core entrepreneurial skills to successfully move ideas and innovations into commercial practice.	<b>Practical training</b> is an essential element in the curriculum of the students and will be developed during the second academic term (15 ECTS). Professional or R+D profiles will be provided in industry or in applied research organizations in Europe which are in close collaboration with all institutions in the consortium. This training can be closely related to the master thesis and will provide inside knowledge in computational mechanics project development and management.

Further details on the content of the study program can be found in the Student Module Handbook. (www.cimne.com/cm-master)

## Second Part Courses

Universitat Politècnica de Catalunya/CIMNE			
Compulsory courses	Solid Mechanics ECTS	Fluid Mechanics ECTS	Total ECTS
Programming for Engineers and Scientists	5	5	5
Computational Mechanics Tools	3	3	5
Computational Wave Propagation	-	2	5
Advanced Discretization Methods	2	5	5
Multiscale Computational Mechanics	5	-	5
Modelling and Analysis in Biomechanics	5	2	5

Swansea University			
Compulsory courses	Structural Engineering ECTS	ECTS (Term2)	Total ECTS
Dynamics of Structures	5	-	5
Computer modelling	5	5	5
Computational Plasticity	5	-	5
Advanced Structural Analysis	5	-	5
Nonlinear Continuum Mechanics	5	-	5
Computational Fluid Dynamics	-	5	5
Reservoir Modelling and Simulation	-	5	5
Computational Electromagnetics	-	5	5
Fluid Structure Interaction	-	5	5

Ecole Centrale de Nantes			
Compulsory courses	Structural Engineering ECTS	Engi. Hydrodynamics ECTS	Total ECTS
Computational methods for incompressible flows	-	4	4
Extended finite element method and level set techniques	3	-	3
Materials modeling for numerical simulations	4	-	4
Numerical methods for simulation of coupled problems	4	4	4

Universität Stuttgart			
Compulsory courses	Solid Mechanics ECTS	Engineering Materials ECTS	Total ECTS
Advanced Computational Mechanics of Structures	6	-	6
Micromechanics of Materials and Homogenization Methods	2	4	6
Foundations of Porous and Multiphase Continua	4	2	6
Engineering Materials: Metals / Concrete / Soils		02/03/02	02/03/02