

Barcelona



Nantes



Swansea



Stuttgart



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).

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)

Tuition fees

16 000 € for third-country students and 8 000 € for others.

Financial support

The European Commission offers scholarships to third-country students 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.

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
Dr. Pedro Díez
Dr. Sonia Fernández-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. Augustí Pérez-Foguet
Dr. Antonio Rodríguez-Ferran
Dr. Ricardo Rossi
Dr. José Sarrate
Dr. Francisco Zárate

UNIVERSITY OF WALES SWANSEA

Prof. Javier Bonet
Prof. Mark Cross
Dr. E. De Souza Neto
Dr. M.G. Edwards
Dr. Y. Feng
Dr. Colin Hayes
Dr. Stephen John Hardy
Prof. Oubay Hassan
Prof. Arthur W. Lees
Prof. Roland W. Lewis
Dr. Ian Masters
Dr. Andrew McCowen
Prof. Kenneth Morgan
Dr. Perumal Nithiarasu
Prof. D. Roger J. Owen
Prof. Gyan N. Pande
Prof. Djordje Peric
Dr. Rajesh S. Ransing
Dr. Johann Sienz
Prof. Paul G. Tucker
Prof. Nigel P. Weatherill
Dr. Richard D. Wood
Dr. R.Y. Xiao

ECOLE CENTRALE NANTES

Prof. Patrice Cartraud
Prof. Frédéric DuFour
Prof. Laurent Gornet
Prof. Ahmed Loukili
Prof. Nicolas Moës
Prof. Gilles Pijaudier-Cabot
Prof. Jean Piquet
Prof. Arnaud Poitou
Prof. Erwan Verron
Prof. Michel Visonneau

UNIVERSITÄT STUTTGART

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 Kröplin
Prof. Christian Miehe
Prof. Josko Ožbolt
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



International Center for Numerical Methods in Engineering (CIMNE)

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www.cimne.com/cm-master

master of science in Computational Mechanics

Erasmus Mundus
Master Course

September 2007



Scholarships
Available

A joint initiative of:

UNIVERSITAT POLITÈCNICA DE CATALUNYA (BARCELONA, SPAIN)

UNIVERSITY OF WALES SWANSEA (UK)

ECOLE CENTRALE NANTES (FRANCE)

UNIVERSITÄT STUTTGART (GERMANY)

In cooperation with CIMNE
www.cimne.com/cm-master



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 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 engineering science. 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 Ph.D. 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 term is aimed at providing a solid background on mechanics and numerical methods. It consists of a set of core courses (20 ECTS) complemented by elective courses (10 ECTS). These core courses are taught jointly at UPC and UWS. Students can select to follow the first term either at UPC or UWS. The second term (30 ECTS) consists of a minor 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 during the 3rd and 4th terms. Practical training at industry or an applied research centre will also be provided during these last two terms.

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

UNIVERSITY OF WALES SWANSEA (UWS), UK
www2.swan.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.



| | | |
|---------------------------------------|---|--|
| First term Core courses 20 ECTS | Second term Minor courses and electives 30 ECTS | Master thesis and practical training 60 ECTS |
| Electives 10 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.

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|--|
| 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) - Computer Assignment (5 ECTS) |

The **second term** 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 term 30 ECTS | Second term 30 ECTS | | | | | Third and fourth term 60 ECTS | |
|--------------|-----------------------|---------------------|---------------------------|--------------------|-----------------------------------|--------------------------|----------------------------------|---|
| | | Solids Mechanics | Structural Engineering | Fluid Mechanics | Engineering Hydrody- namics | Engineering Materials | Research Project Plan | Master's thesis and practical training |
| UPC/CIMNE | • | • | | • | | | • | • |
| UW SWANSEA | • | | • | • | | | • | • |
| EC NANTES | | | • | | • | | | • |
| U. STUTTGART | | • | | | | • | | • |

| Elective courses | Master thesis and practical training |
|---|--|
| These 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. Excellent seminar series on computational mechanics with leading international faculty and professionals from industries complement the formal educational programme with exposure to advanced topics. | Students will carry out their Master Thesis (40 ECTS) in the same institution where they take their second term, 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. Each student will present at the beginning of the second academic year a research project plan (6 ECTS): the assigned thesis topic with the proposed research plan. Students are allowed and encouraged to complete their thesis at their earliest convenience, but must submit this work before June 2008. Practical training is an essential element in the curriculum of the students and will be developed during the second academic course (14 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 studyprogram can be found in the Student Module Handbook. (www.cimne.com/cm-master)

Second Term Courses

| Universitat Politècnica de Catalunya/CIMNE | | | |
|---|-------------------------|-------------------------|------------|
| Compulsory courses | Solid Mechanics ECTS | Fluid Mechanics ECTS | Total ECTS |
| Computational solid mechanics | 4 | | 4 |
| Finite elements in fluids | | 4 | 4 |
| Computational structural mechanics and dynamics | 4 | | 4 |
| Computational wave propagation | 1 | 3 | 4 |
| Computer assignment | 2 | 2 | 4 |

| University of Wales Swansea | | | |
|--|--------------------------------|-------------------------|------------|
| Compulsory courses | Structural Engineering ECTS | Fluid Mechanics ECTS | Total ECTS |
| Dynamics of Structures* | 5 | | 5 |
| Computational Plasticity* | 5 | | 5 |
| Advanced Structural Analysis* | 5 | | 5 |
| Computational Case Study (structures)* | 10 | | 10 |
| Computational Fluid Dynamics* | | 5 | 5 |
| Computational Case Study (fluids)* | | 10 | 10 |

* Compulsory courses for the Solids and Structures minor. * Compulsory courses for the Fluid Mechanics minor.

| Ecole Centrale de Nantes | | | |
|---|--------------------------------|-----------------------------|------------|
| Compulsory courses | Structural Engineering ECTS | Engi. Hydrodynamics ECTS | Total ECTS |
| eXtended Finite Element Method and Level Set techniques | 3 | | 3 |
| Multi-Scale Structural Analysis | 3 | | 3 |
| Materials Modelling for Numerical Simulations | 4 | | 4 |
| Fluid Mechanics | | 5 | 5 |
| Numerical techniques for PDEs in fluids | | 5 | 5 |

| 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 | | 2/3/2 | 2/3/2 |