

**PROPOSTA DE MÀSTERS PRESENTATS A LA 3a
CONVOCATÒRIA ERASMUS-MUNDUS
MASTER OF SCIENCE IN COMPUTATIONAL MECHANICS**

Acord núm. 144/2005 pel qual es ratifica la proposta de Master of Science in Computational Mechanics

- Document aprovat per la Comissió de Docència del Consell de Govern del dia 17/05/2005
- Document aprovat pel Consell de Govern del dia 27/05/2005

DOCUMENT CG 8/05 2005

Vicerektorat d'Ordenació Acadèmica
Comissionat de l'Espai Europeu d'Educació Superior
Maig 2005

Proposta per a la 3^a convocatòria Erasmus Mundus
MASTER OF SCIENCE IN
COMPUTATIONAL MECHANICS

Oñate Ibáñez de Navarra, Eugenio (onate@cimne.upc.edu)
Huerta Cerezuela, Antonio (antonio.huerta@upc.edu)

10 de maig de 2005

1. Nom de les persones i les unitats de la UPC responsables del màster:

EUGENIO OÑATE Centre Internacional de Mètodes Numèrics en l'Enginyeria
(CIMNE)
ANTONIO HUERTA Departament de Matemàtica Aplicada III (MA3)

Posició en el consorci de d'institucions europees: COORDINADORS.

2. Institucions participants:

Universitat Politècnica de Catalunya
University of Wales Swansea (Swansea, Regne Unit)
Ecole Centrale de Nantes (Nantes, França)
Universität Stuttgart (Stuttgart, Alemanya)

3. Dades generals del programa:

3.1. Denominació del programa:

MASTER OF SCIENCE IN COMPUTATIONAL MECHANICS

3.2. Any acadèmic d'implantació:

Curs 2006/07

3.3. Durada del pla en crèdits europeus.

El títol de Master of Science in Computational Mechanics es de 120 ECTS.

L'alumne obté 60 ECTS mitjançant assignatures (obligatòries i optatives) durant el primer i segon semestre. La tesi de màster li proporciona 30 ECTS. Per a tot alumne amb formació prèvia suficient, els 30 ECTS restants es convaliden amb assignatures d'estudis previs.

4. Extracte de les característiques del programa:

A continuació s'inclou un paràgraf de l'apartat 2-2.7 de la sol·licitud.

The Master course is an extension of a Master Degree existing since 1987 at UPC focused on Numerical Methods in Engineering. This course has been running at UPC since 1987 with administrative support of CIMNE. The new Master in Computational Mechanics will be benefit for the academic and administrative experience and knowledge accumulated in UPC and CIMNE related Master degree. The aims and content of the new Master expand those of the existing one towards a more focalized areas of computational mechanics, in particular those related to structural and fluid mechanics. Special emphasis has also been put in extended the range of practical applications in those areas of the method.

4.1. Orientació, objectius i perfil professional del màster.

A continuació s'inclouen alguns paràgrafs de l'apartat 2. de la sol·licitud (Summary description of the Masters Course)

The Master of Science 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 the students with the skills for the modeling, 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 may take the Master's as a professional terminal degree, or in preparation for a Ph.D. degree.

4.2. Programa d'estudis i mobilitat acadèmica.

Programa d'estudis (a continuació s'inclouen alguns paràgrafs de la sol·licitud)

The Master program consists of three terms. All teaching will take place in English.

First Term Core courses 20 ECTS	Second Term Minor courses and electives 30 ECTS	Master's thesis 30 ECTS
Electives 10 ECTS		

***The first term** provides the fundamental background with four core courses amounting to 20 ECTS, as well as elective courses adding up to a total of 30 ECTS. The core courses include a Computer Assignment course, which integrates in a hands-on fashion the practice of Computational Mechanics. The main purpose of the first module electives is to ensure an effective cultural and academic integration of the students in the new environment, as well as to provide the required computer and programming skills. The first module is simultaneously taught at Barcelona and Swansea, with identical core courses and a unified evaluation. The core courses are listed below (see the Student Handbook for detailed descriptions).*

- *Numerical Methods for Partial Differential Equations (5 ECTS)*
- *Finite Element Method (5 ECTS)*
- *Continuum Mechanics (5 ECTS)*
- *Computer Assignment (5 ECTS)*

At the end of the first semester, successful students will move to a different institution in order to pursue the second and third term. Before the start of the second term, institutions where the local language is not English will offer language training courses to students.

***The second term** can be pursued at any of the four partner institutions. It is organized in minors, consisting of a set of courses emphasizing, or bearing particular relevance to, a specific area in Computational Mechanics. Each institution offers two minors, the contents of which are adapted to its expertise, and defines the compulsory and elective courses for each minor. While some courses fall strictly within one minor, other courses deal with transversal advanced topics relevant to more than one minor. Student must choose a partner institution for the second module, different from that where they conducted the first module. In agreement with the local requirements of the second*

institution, the student must select a set of courses adding up to 30 ECTS, in such a way that at least 15 ECTS qualify for a minor.

Institution	First term 30 ECTS	Second term 30 ECTS				Master's thesis 30 ECTS
		Solids & Structures	Fluid Mechanics	Eng. Fluid dynamics	Eng. Materials	
UPC/CIMNE	x	x	x			x
UWS	x	x	x			x
ECN		x ¹		x		x
U. Stuttgart		x ²			x	x

Progressions Boards at the end of the second term are arranged locally but are subject to common assessment methods and regulations. Students that do not meet the necessary requirements to continue into the third term (master's thesis), but have accumulated 60 ECTS credits, are offered a PG Diploma in Computational Mechanics.

***The third term** is devoted to the Master's thesis, which can be research or industry oriented. Students carry out their thesis in the same institution where they take their second taught term, so that they can choose a topic related to one of their areas of specialization. The thesis should be submitted 18 months after the end of the course (end of March of the second academic session). The Board of Studies of the consortium, during its February meeting, may extend this deadline by a maximum of 6 months if the personal circumstances of the student justify it (see the Student Handbook). Once completed, the Master's thesis will be defended in front of a local committee, with the external assessment of at least one faculty member from another institution of the consortium. The final mark of the thesis will be awarded by the Board of Studies³ of the Master's Program.*

Mobilitat acadèmica (a continuació s'inclouen alguns paràgrafs de la sol·licitud)

Students will study in two of the Consortium institutions. The choice of institution will depend mostly on the student's preferences and also on an evenly distribution of students among the institutions. Students will present their preferences in the admission form, probably related to the desired specialization offered at each institution. The Board of Studies at its meeting in early February will decide both if a student is admitted and his/her corresponding mobility. This will be communicated to the student before he/she is registering (a reserve list will be defined in case any student declines admission).

Students will meet all together in Barcelona on an induction weekend to meet the class, teachers and get all the information related to the Master Program (handbook of courses, virtual centre, etc.). They will pursue their 1st term in Barcelona or Swansea. Their 2nd and 3rd terms will be in any of the four institutions (obviously, different from the one they were in their 1st term). Only in justifiable exceptional conditions a student can pursue its 3rd term in the first institution he/she visited in his/her 1st term (a formal procedure for these exceptional cases is already foreseen in the Memorandum of Agreement) These situations will be decided in the Board of Studies meeting in early July (close to the end of the 2nd term).

¹ A structural approach.

² A materials approach.

³ See the Memorandum of Agreement for the Erasmus Mundus consortium governing the European Master's Degree in "Computational Mechanics"

Barcelona: induction weekend (all students: 40~60)				September
Barcelona: ½ students (20~30)		Swansea: ½ students (20~30)		1 st term 30ECTS Sept.-Feb.
Swansea	Stuttgart	Nantes	Barcelona	2 nd term 30ECTS Mar.-Aug.
Swansea: ¼ students (10~15)	Stuttgart: ¼ students (10~15)	Nantes: ¼ students (10~15)	Barcelona: ¼ students (10~15)	3 rd term 30ECTS Sept.-Feb

Scholar mobility will be agreed between the scholar and the Board of Studies. Again a compromise will be sought between the desire of the scholars and an even distribution among the institutions. Although in this case since at least one of the scholars will act as external reviewer (and thus will assist the July Board of Studies meeting), Barcelona will receive more man months than the other institutions.

S'adjunta el document "Master of Science in Computational Mechanics Handbook" (encara en construcció) amb la descripció dels possibles itineraris dels estudiants i la descripció de les assignatures més rellevants.

4.3. Organització docent: unitats de la UPC que participen en el desenvolupament del programa.

Els professors de la UPC que han d'impartir les assignatures i dirigir les tesis de màster estan adscrits principalment al

- Departament de Matemàtica Aplicada III (MA3), i al
- Departament de Resistència de Materials i Estructures a l'Enginyeria (RMEE).

4.4. Requisits bàsics d'accés i perfil de l'estudiantat.

A continuació s'inclouen alguns paràgrafs de l'apartat 2. de la sol·licitud (Summary description of the Masters Course)

Admission Requirements:

A candidate must hold a Bachelor of Science degree or appropriate science degree by an institution recognized by one of the members of the consortium.

A score of at least

- 230 in the computer-based TOEFL (570 in the paper-based version) or
- 750 in TOEIC or
- 7.0 in IELTS

is required for students from non-English speaking countries.

Applications must include a statement of purpose (one/two pages), a CV, complete academic transcripts and three letters of recommendation.

Admission Criteria:

- *Engineering degree or science degree, rank of the institution, and rank of the student in the institution,*
- *language skills*
- *letters of recommendation*
- *statement of purpose*
- *additional available information (EPS for Chinese students)*

Més concretament, els alumnes que vinguin d'una universitat de l'estat espanyol hauran de haver cursat prèviament un mínim de 240 ECTS en titulacions e institucions reconegudes pel consorci.

4.5. Condicions per a la obtenció del títol; acords respecte a la titulació (doble o conjunta), i denominació del títol que emetrà la UPC.

A continuació s'inclou un paràgraf de l'apartat 2-2.5 de la sol·licitud.

Universitat Politècnica de Catalunya (UPC) and University of Wales Swansea (UWS) will implement a JOINT DEGREE award as soon as it is feasible and legally possible.

De manera que, tots els alumnes del master de la UPC o de la UWS obtindran un *joint degree award* (independentment d'on cursin els estudis).

Els alumnes del màster Erasmus-Mundus obtindran a més el diploma de la universitat on cursin el segon i tercer semestre (*double degree*).

El títol que emetrà la UPC conjuntament amb la University of Wales, Swansea (Universitat de Gal·les, Swansea) es denominarà: *Master of Science in Computational Mechanics*

Previsió de recursos necessaris per a la posada en marxa del programa fins a la plena implantació.

Recursos de professorat

10 professors en dedicació parcial per a la docència i tutoria de les assignatures obligatòries	3 de 8h/setmana, 4 de 10h/setmana 3 de 15h/setmana
7 professors en dedicació parcial per a la docència i tutoria de les assignatures optatives	5 de 4h/setmana 2 de 8h/setmana

Recursos de personal de gestió y administratiu

- 1 Professor a temps complet en tasques de direcció
- 1 Professor a temps parcial en tasques de cap d'estudis (20h/setmana)
- 1 Administratiu a temps parcial en tasques de gestió administrativa i financera del curs (10h/setmana)
- 1 Administratiu a temps parcial en tasques de gestió acadèmica i d'acollida de l'estudiant (20h/setmana)

Recursos de material docent i d'administració

(ordinadors personals, equipament docent, material de difusió del curs, cost de difusió, etc.)

Cost del recursos

- Cost estimat del professorat acadèmic: 450h de classe i tutoria x 100€/h = 45.000€
- Cost estimat del personal de gestió i administratiu: 90.000€
- Cost estimat del material docent i administratiu*: 30.000€

(* Aquest cost correspon a la 1^a edició del curs i reduirà a la meitat en les següents edicions del curs.)

Cost estimat del curs: 180.000€

Finançament del recursos

- Matrícules: 25 alumnes x 4.000€ = 100.000€ (*)
- Aportació d'organismes acadèmics (UPC) i de recerca (CIMNE): 35.000€
- Aportació d'empreses: 30.000€

Total finançament: 180.000€

(*) Valoració dels ingressos mitjans per matrícula (inclou 10 alumnes del programa Erasmus-Mundus)

Qualsevol desviació de l'origen dels ingressos haurà d'ésser assumida per els altres fons d'ingressos.

Documentació adjunta

1. Draft of the Master on Computational Mechanics HANDBOOK
2. MEMORANDUM OF AGREEMENT for the Erasmus Mundus consortium, governing the European Master's degree in Computational Mechanics
3. ADDENDUM to the memorandum of agreement
4. Draft of the ASSESSMENT RULES