

**Title of the Masters Course:****MATHMODS - Mathematical Modelling in Engineering: Theory, Numerics, Applications****Duration:** 2 years**Course description:**

Mathematical modelling lies at the heart of most current technological innovations and has become a fundamental tool in many fields of engineering. Essentially multidisciplinary in its applications, mathematical modelling and simulation is in its own right a key technology which is bound to increase its presence within efficient industries and business innovation departments. The proposed programme reflects this multidisciplinary nature, drawing on the unifying mathematical aspects from the various and often separate engineering disciplines. This allows the development of an essentially unified methodological approach to modelling and simulation of real engineering challenges. The consortium is coordinated by the University of L'Aquila in Italy (UAQ) and involves other four leading institutions in Europe: the University of Nice - Sophia Antipolis in France (UNSA), the Autonomous University of Barcelona in Catalonia (UAB), the University of Hamburg in Germany (UHH) and the Gdansk University of Technology in Poland (GUT). The language of the course will be exclusively English. An introduction to local culture and language will also be offered to the students in each semester. Admission will be restricted to 60 students. The students to professor rate will be approx 2.

The MathMods Master's degree course will be given in four semesters. Each semester will total 30 ECTS credits. Mobility scheme will provide for at least two locations. The first year will be common for all students. This will guarantee an equal knowledge platform for all of them. The second year will be divided into five tracks, which reflect the partners' field of excellence. Students will spend their fourth semester on writing their Master's Thesis.

**SUMMARY AND STRUCTURE OF THE STUDY PROGRAMME****First semester: Theory (UAQ)**

- Functional analysis in applied mathematics and engineering
- Control systems
- Dynamical systems and bifurcation theory
- Fluid dynamics
- Applied partial differential equations (PDEs)

**Second semester: Numerics (UNSA)**

- Algorithms and data structures
- Numerical approximation of PDEs by finite differences and finite volumes
- Numerical methods for PDEs
- Optimization
- Training in industry

**Third semester: Applications**

- UAB: Stochastic modelling and optimization
- UAQ: Modelling and simulation of electronic devices
- GUT: Advanced computational methods in material science
- UHH: Modelling, simulation, and optimization of complex systems
- UNSA: Mathematical modelling applications to biology and finance

**Fourth semester: Thesis (UAB / UHH / UAQ / GUT / UNSA)****ADMISSION CRITERIA**

Applicants are expected to have an excellent university record, with at least 3 years of prior studies (corresponding to 180 ECTS) and with major in one of the following fields: Applied Mathematics, Physics, Engineering or equivalent qualification. Satisfactory level of spoken and written English will be TOEFL 550 or equivalent.

**Website:**

<http://www.mathmods.eu>

**Partners:**

University of L'Aquila (Co-ordinating Institution)  
University of Nice - Sophia Antipolis, France  
Autonomous University of Barcelona, Spain  
Gdansk University Of Technology, Poland  
University of Hamburg, Germany

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