



PhD in MODELLI E METODI MATEMATICI PER L'INGEGNERIA / MATHEMATICAL MODELS AND METHODS IN ENGINEERING - 39th cycle

**PNRR 118 INTERDISC Research Field: HYBRID NUMERICAL METHODS FOR THE DESIGN
OF ACOUSTICALLY COMFORTABLE ENVIRONMENTS**

Monthly net income of PhDscholarship (max 36 months)
€ 1325.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
<p>Motivation and objectives of the research in this field</p>	<p>In everyday life, we spend a lot of time in closed environments such as offices, classrooms, schools, conference rooms, theatres, and restaurants where ambient noise is often high, with the possibility of leading to a significant level of both mental and physical fatigue. There are numerous studies that have shown how a harmonious environment that meets acoustic comfort criteria reduces stress, improves listening, teaching, and learning, and increases the perception of the well-being of users. The research has as its objective the study and development of new hybrid numerical methods for the simulation of the sound field, in order to evaluate the acoustic quality in closed environments and therefore to guarantee acoustically comfortable and safe spaces for people's health and well-being. The research aims to provide support tools for urban design and planning for the creation of sustainable cities and communities and to promote a culture of attention to the acoustic quality of environments. The present research fits into the PNRR thematic area "Innovation, research and digitisation of healthcare".</p> <p>The proposed research topic can lead to a significant development of knowledge in the above mentioned areas of interest of the PNRR. Moreover, the proposed research promotes interdisciplinarity approaches, membership of international networks and inter-sectoral collaborations.</p>



Methods and techniques that will be developed and used to carry out the research	<p>The aim of the research is to combine different modeling/numerical techniques for the accurate simulation of the broadband sound field. Appropriate finite element numerical schemes will be used in the mid-low frequency range, while geometric acoustic numerical techniques, such as beam tracing, will be employed in the mid-high frequency range. The combined use of these approaches can allow us to obtain a more precise and efficient broadband acoustic simulation and overcome the limitations of currently available commercial software. Thanks to the multidisciplinary research framework involving experts in both experimental and numerical aspects, the numerical tools will be conceived, developed, and validated in parallel with a large experimental campaign on relevant benchmark cases.</p>
Educational objectives	<p>The PhD student will develop specific competencies on the mathematical and numerical modelling of (room) acoustic problems as well as a deep physical and engineering understanding of the theory of acoustics and its experimental characterization.</p>
Job opportunities	<p>Main opportunities in the job market include Universities, Research Centers, R&D departments of engineering companies.</p>
Composition of the research group	<p>10 Full Professors 17 Associated Professors 18 Assistant Professors 44 PhD Students</p>
Name of the research directors	<p>Prof. Ilario Mazzieri; Prof. Fabio Antonacci</p>

Contacts	
<p>ilario.mazzieri@polimi.it, fabio.antonacci@polimi.it</p>	

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--



Scholarship Increase for a period abroad	
Amount monthly	662.5 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	
By number of months at the company	0
Institution or company where the candidate will spend the period abroad (name and brief description)	KU Leuven University
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): financial aid per PhD student per year</p> <p>1st year: max 1.800,47 euros 2nd year: max 1.800,47 euros 3rd year: max 1.800,47 euros</p> <p>The PhD students are encouraged to take part in activities related to teaching, within the limits allowed by the regulations. 1 individual PC per student + several shared PC. Access to one cluster with 32 processors and 384 GB RAM, and to several multi-processor servers.</p>