



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 40th cycle

THEMATIC Research Field: EXPERIMENTAL AND COMPUTATIONAL AEROACOUSTICS FOR ENGINEERING APPLICATIONS

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>Aerodynamic noise is a topic of growing importance in many application fields. This phenomenon is related to the turbulent structures capable of generating pressure waves synchronized on specific frequencies. The problem plays a fundamental role for example in the automotive industry, where electrification reduces noise emissions from other sources, such as the engine, and in the railway industry. In this context, the control of aeroacoustic sources is of great importance to mitigate noise both inside and outside the vehicle. The fact that sound is generated within the same medium through which it propagates increases the level of theoretical-experimental complexity and requires the development of dedicated modeling strategies and validation tools. In this sense, the research group has developed in recent years a numerical tool for computational aeroacoustics (AeroSPEED), based on a hybrid approach in which the solution of the acoustic problem with high-order numerical schemes allows an accurate and efficient solution of the sound field. However, an experimental validation of these methodologies through specific tests in controlled conditions, which also involves other research structures in Italy and around the world, is still an open point. Furthermore, in parallel with the validation phase, a possible improvement of the methodology, considering and comparing alternative acoustic models and the possibility of integrating tools for reducing computational and storage requests (POD, Proper Orthogonal</p>



	<p>Decomposition, and DMD, Dynamic Mode Decomposition) is of great interest. Finally, the calculation tool can be applied to some real case studies. The research project therefore aims at improving the knowledge of aeroacoustic phenomena and at developing possible solutions for mitigating aerodynamic noise. This will support the technological development of industrial sectors that face the problem of designing increasingly silent products, with indisputable benefits for people's health and well-being.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>This research is characterized by a strong interdisciplinary approach. The skills of the DMAT MOX laboratory will allow to refine advanced numerical schemes to solve aero-acoustics problems. These skills will be integrated with DMEC theoretical and experimental knowledge in the fluid dynamics and acoustic fields. The CFDHub interdepartmental laboratory will provide the computing capabilities to solve the numerical problems. At the same time, an experimental setup will be developed for the validation of the model in a aeroacoustic wind tunnel. The PSVL interdepartmental laboratory will provide the instrumentation for the experimental tests. During the first phase, the research activity will focus on the validation of the methodology by analysing simple case studies, for which a benchmarking activity with other research institutes can be carried out. In the second phase, the model will be applied to case studies of industrial relevance, with particular reference to the automotive and railway sectors.</p>
<p>Educational objectives</p>	<p>The candidate will acquire high-profile skills and will be working on one of the most significant and challenging problems in NVH engineering, dealing with both theoretical and experimental methodologies. He/she will become an expert in aeroacoustic modelling and experimental testing, including signal processing and system identification. The candidate is supposed to provide original contributions to the development and experimental validation of innovative simulation tools.</p>
<p>Job opportunities</p>	<p>Future job opportunities are primarily in the automotive</p>



	<p>field (especially in NVH area), i.e. R&D departments of automotive industries (including automobile manufacturers and vehicle component suppliers in general). Besides this, job opportunities comprise national and international academic and nonacademic institutions and organizations, engaged in innovation, research and technical development.</p> <p>Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary, compared Master of Science holders in the same field.</p>
Composition of the research group	<p>1 Full Professors 3 Associated Professors 1 Assistant Professors 2 PhD Students</p>
Name of the research directors	<p>Proff. Roberto Corradi, Ilario Mazzieri (DMAT)</p>

Contacts

For questions about scholarship/support please contact phd-dmec@polimi.it

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	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops and conferences) for a total amount of € 6.114,50.

Our candidates are strongly encouraged to spend a research period abroad, joining high-level research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 750 euro/month- net amount).

Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD candidate. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed



by the regulations.