POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 41st cycle

THEMATIC Research Field: AERODYNAMIC OPTIMIZATION OF RAILWAY VEHICLES FOR SAFETY AND PERFORMANCE PURPOSES THROUGH WIND TUNNEL TESTING AND CFD SIMULATIONS

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	Rail transport is increasing and the requirements for safety and environmental impact are growing, requiring the development of advanced design techniques. Aerodynamics plays an important role in both safety and energy consumption. Aerodynamic safety depends on crosswind, but also affects the safety of passengers on platforms and workers at the trackside due to slipstream effects. Performance is mainly affected by aerodynamic drag, that directly impacts the energy consumption.
Methods and techniques that will be developed and used to carry out the research	The study will employ both experimental and numerical methods. Experimental tests in a wind tunnel will be used to assess the aerodynamic features of train models, focusing on some specific aspects. Numerical methods will consist mainly of CFD studies to be validated against experimental data, and will be used to understand the impact of specific geometric features on train aerodynamics. Moreover, for safety studies, multibody dynamics will be used to assess the train's safety and the Characteristic Wind Curves (limit wind speeds for crosswind train stability).
Educational objectives	- Development of a research program - Management of an experimental test campaign - Teamwork and team communication - Design and execution of HPC CFD studies

	- Data analysis and critical discussion of results
Job opportunities	Job opportunities can be found in Academia as well as in the Industry. The skills and competences developed can be exploited not only in the field of railway vehicle aerodynamics but can also be applied in any scientific field. Concerning the specific field, all industries working on railways are interested in competencies in vehicle aerodynamics.
Composition of the research group	1 Full Professors 3 Associated Professors 2 Assistant Professors 1 PhD Students
Name of the research directors	Proff. Gisella Tomasini, Daniele Rocchi

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

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). Additionally, PhD candidates who spend at least 3 months abroad are eligible for an extra reimbursement of €3,000 to cover travel expenses. 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.