



PhD in MECHANICAL ENGINEERING - 33rd cycle

Research Area n. 2 - Sustainable Mobility

Number of scholarship offered	2
Department	DIPARTIMENTO DI MECCANICA

Description of the Research Area

In order to address the societal challenges defined by EU and referring to CO2 emission, energy efficiency, noise pollution, zero accidents and renewable energy, a wide range of solutions need being studied and developed, which are applicable to the design, integration of design and manufacturing, testing and monitoring of transport systems, vehicles and infrastructures.

This research area encompasses a wide range of applications related to road, rail, air and waterborne transport modes. The main topics related to this area are systems and components design, vehicle dynamics and control, vehicle-infrastructure dynamic interaction, vehicle aerodynamics and vibroacoustics, active, passive and preventive safety, intelligent transport systems, diagnostics and prognostics, new and advanced propulsion systems, energy harvesting solutions and innovative charging methods for ground and maritime applications.

Two generic scholarships are available in this area, focusing on the research field of Railways and Automotive.



PhD in MECHANICAL ENGINEERING - 33rd cycle

Research Area n. 2 - Sustainable Mobility

Research Field: RAILWAYS AND AUTOMOTIVE

Monthly net income of PhDscholarship (max 36 months)

€ 1200.0

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

Railways are among the safest means to move passengers and freights over a wide range of distances. However, a continuing improvement of safety measures is sought after, in an effort to further reduce the occurrence of failures and accidents. At present, research activities being carried out in this field at the Department of Mechanical Engineering encompass the following areas:

- 1) new methods for health monitoring and fault detection as applied to both the rolling stock (bogies, suspension components, axles and wheelsets) and the infrastructure (track, overhead equipment);
- 2) mechatronic solutions for railway vehicle suspensions;
- 3) mathematical modelling of train-track interaction in the high frequency range and rolling noise;
- 4) numerical methodologies to model the emission and propagation of aerodynamic noise;
- 5) train aerodynamics.

On the other hand, the decreasing of the availability of fossil fuels and the environmental issues push the research towards the development of high efficiency power trains for vehicles that transport people, goods and mobile operating machines. In this general situation, the studies are focused on innovative high efficient power train systems considering both the sizing of the components and the energy management strategies for fuel consumption minimization on hybrid vehicles or



	<p>stability and safety of electric vehicles.</p> <p>Possible research topics in this area are:</p> <ul style="list-style-type: none"> • vehicle dynamics and control (including modelling, testing, virtual sensing, parameter identification and mass properties assessment) • active, passive and preventive safety (including crashworthiness, stability, curving performance and response to aerodynamic forces) experimental techniques (including NDT, embedded sensors, etc.) • brake systems (including NVH, brake by wire, thermoelastic behaviour, self energizing brakes) • experimental techniques (including NDT, embedded sensors, etc.) • vehicle aerodynamics • ride and acoustic comfort (NVH) • farm tractors (new concepts and testing) • tyre dynamics, tyre-road contact and tyre noise (modelling and indoor/outdoor testing) • vehicle-infrastructure interaction • V2V, V2I and I2V communication systems • hybrid and electric vehicles (including innovative charging solutions) • energy saving and energy harvesting solutions • ADAS, autonomous and/or connected road vehicles
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>PhD candidates' activity will deal with the modelling of the rolling stock-infrastructure interaction, the full energetic model of the vehicle (power train and general energetic management algorithm) and with experimental tests in the labs and/or on field, to validate the numerical simulation model.</p>
<p>Educational objectives</p>	<p>We provide doctoral candidates with high-level scientific training, fostering and refining research and problem solving abilities by focusing on both theoretical and experimental skills.</p> <p>A PhD in Mechanical Engineering will be able to layout,</p>



	draft and carry on original research, by leading a research group or working in a team.
Job opportunities	<p>National and international academic and non-academic institutions and organizations, engaged in innovation research and technical development; high-tech SMEs, government departments.</p> <p>List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:</p> <ol style="list-style-type: none"> 1. RFI 2. Bombardier 3. Hitachi Rail 4. University of Birmingham 5. Southwest Jaotong University 6. University of Southampton 7. TU Delft 8. Pirelli 9. Ferrari 10. Magneti Marelli
Composition of the research group	<p>12 Full Professors 9 Associated Professors 10 Assistant Professors 20 PhD Students</p>
Name of the research directors	Resta, Bruni, Collina, Cheli, Braghin

Contacts	
<p>Proff. Resta, Boccione, Bruni, Collina, Cheli, Braghin, Sabbioni, Corradi, Rocchi.</p> <p>ferruccio.resta@polimi.it marco.boccione@polimi.it stefano.bruni@polimi.it andrea.collina@polimi.it federico.cheli@polimi.it francesco.braghin@polimi.it edoardo.sabbioni@polimi.it roberto.corradi@polimi.it</p>	



daniele.rocchi@polimi.it

For further information visit: www.mecc.polimi.it
<http://www.mecc.polimi.it/ricerca/sezioni/meccanica-dei-sistemi/>

phd-dmecc@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)	--

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

Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student per year:

2nd year: 1.370 euro per student

3rd year: 1.370 euro per student

Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD student. 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.

Computer availability:

1st year: individual use

2nd year: individual use

3rd year: individual use

Desk availability:

1st year: individual use

2nd year: individual use

3rd year: individual use