



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 40th cycle

**THEMATIC Research Field: MONITORING SYSTEMS FOR RAILWAY VEHICLES USING
SMART DEVICES**

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

Monitoring railway systems is essential for safety, efficiency, and cost reduction, both for rolling stock and infrastructure. However, installing sensors on trains in operation can be challenging for certain types of trains, such as:

- Freight trains that travel without onboard power, making monitoring difficult.
- Passenger trains, where installing new sensors could interfere with onboard network management, requiring costly software upgrades.

In both cases, low-power wireless sensors, powered by batteries or renewable energy sources, offer a simple and less invasive solution, enabling continuous monitoring and predictive maintenance without altering existing systems, thus reducing requalification costs.

Methods and techniques that will be developed and used to carry out the research

The activity involves the development of a sensor system fully customized for the specific application to best meet the monitoring requirements. The developed system will be equipped with wireless communication systems for transmitting the acquired data. The definition of sensor positioning and the validation of the results will be carried out based on multibody simulation models, either dedicated or adapted to the specific application.

Educational objectives

The candidate will acquire high-profile skills and will be dealing with both theoretical and experimental



	<p>methodologies. He/she will develop knowledge in the following areas:</p> <ul style="list-style-type: none"> • analysis of complex dynamic systems with different methods and approach (numerical simulation, co-simulation of interacting virtual and physical components, experimental identification and validation) • analysis and optimisation of low power devices both in term of sensor and communication • technology and innovation in railways monitoring system design and testing <p>Finally, the candidate will gain the capability of working and cooperating in a multidisciplinary team.</p>
Job opportunities	<p>Monitoring systems manufacturing companies, Rail vehicle manufacturers, Rail transport operators, Railway infrastructure managers</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> <p>List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research include University of Huddersfield, Universitat Politècnica de València, Contact, Hitachi Rail, Trenitalia, RFI</p>
Composition of the research group	<p>1 Full Professors 2 Associated Professors 2 Assistant Professors 0 PhD Students</p>
Name of the research directors	Prof. Davide Tarsitano

Contacts
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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)	--
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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 euro 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.