



# PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 38th cycle

Research Area n. 2 - Sustainable Mobility

**PNRR\_352 Research Field: OPTIMISATION OF SMART SENSORS FOR PREDICTIVE AND  
CONDITION-BASED MAINTENANCE OF RAILWAY WHEELSETS**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1400.0**

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**

The research activity aims at developing infrastructures for sustainable mobility and, in particular, focuses on the development of innovative solutions to support condition-based maintenance (CBM) and predictive maintenance of railway wheelsets, with the aim of increasing the level of reliability and safety and reducing operating costs.

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

Current smart sensor technology will be applied and extended as part of the project. In particular, the student will:

- optimise intelligent sensor solutions based on i.e. accelerometers, strain gauges, GPS, equipped with a microprocessor for real-time data processing, data storage and GSM connectivity, starting from solutions already studied in previous projects;
- develop autonomous power supply solutions (i.e. vibration harvester, solar), optimizing functionality and consumption;
- optimise the algorithms for processing the acquired signals to determine representative parameters for the identification of defects on wheelset and on the railway line;



	<ul style="list-style-type: none"> <li>develop predictive models able to capture the evolution of defects with the service to optimize vehicle maintenance stops;</li> </ul>
<b>Educational objectives</b>	The student will learn: research project management and publishing skills; analytical models and experimental tests development skills (particularly identification algorithms, autonomous power supply solutions); presentation and teaching skills.
<b>Job opportunities</b>	Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary, compared to Master of Science holders in the same field. Companies in the transportation sector (Lucchini but also Bombardier, Alstom, Mercitalia Intermodal, Trenitalia,) will be very interested in hiring a PhD-graduate with application experience in the sector.
<b>Composition of the research group</b>	1 Full Professors 2 Associated Professors 1 Assistant Professors 1 PhD Students
<b>Name of the research directors</b>	Proff. Francesco Castelli Dezza, Gisella Tomasini

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

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	700.0 €
<b>By number of months</b>	6

<b>National Operational Program for Research and Innovation</b>	
<b>Company where the candidate will attend the stage (name and brief description)</b>	Lucchini RS S.p.A.



<b>By number of months at the company</b>	6
<b>Institution or company where the candidate will spend the period abroad (name and brief description)</b>	Lucchini Sweden AB (or) Chalmers University
<b>By number of months abroad</b>	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 5.707, 13.

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.