



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

**THEMATIC Research Field: ASSESSMENT AND ACCEPTABILITY OF COOPERATIVE AND
AUTOMATED MOBILITY**

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**

Connected, Cooperative and Automated Mobility (CCAM) is expected to solve a number of issues of road transportation. Traffic routes will interact without interfering, people and goods transportation will be more efficient, road accidents and casualties will dramatically reduce, environmental impact will drop. A clear understanding on how to define the environmental conditions which allow automated vehicles to circulate safely has to be gained. The research focuses on the assessment of the capabilities and acceptability of technologies developed to enable CCAM. In particular, the implementation of eco-driving styles, and the deployment of automated mobility will be targeted. The research is expected to improve the effectiveness and the robustness of control logics. Moreover, the acceptance of such technologies by the users (both drivers or passengers) has to be proven: the success of CCAM is related to the willingness of people to buy and use them. Therefore, methods for understanding the the psychophysiological aspects relevant for the interaction of Humans with automated vehicles have to be developed.

The scholarship is financed for euro 25.000 in the framework of the **PRIN 2022 Project HL4IT - Interaction of Humans with Level 4 automated vehicles in an Italian environment** Prot. 2022L3M25K, CUP D53D23003750006, PNRR M4C2 I1.1; and for a further



	<p>amount of euro 25.000 in the framework of the PRIN 2022 Project The Green Co-Driver, a human-interactive self-driving system that improves the energy efficiency of road vehicles: implementation and driving-simulator tests Prot. 2022W733FA, CUP D53D23004160006, PNRR M4C2 I1.1.</p> <p>Norms of Reference: D.D. 104 of 02/02/2022 (call PRIN 2022) within the framework of the National Recovery and Resilience Plan, Mission 4 Education and Research - Component 2 From Research to business - Investment 1.1., funded by the European Union - Next GenerationEU.</p>
Methods and techniques that will be developed and used to carry out the research	<p>Driving simulators are extensively used by car manufacturers and OEMs to develop products while reducing the costs and risks associated with outdoor tests. The DriSMi Lab of Politecnico di Milano (https://www.drismi.polimi.it/) hosts an innovative dynamic driving simulator, where the cockpit of a commercial car moves throughout a 6x6-meter platform thanks to a system of cables and electric actuators. Through its innovative features, the simulator provides an immersive and realistic test environment that can be safely experienced also by non-professional drivers. This last opportunity appears nowadays of particular interest as new ADAS systems or control logics for CCAM vehicles can be developed also considering the feedback from common users. The final customer can thus influence the development of such systems so that they can be tailored on specific profiles to improve their acceptance. It is essential to develop interdisciplinary skills that include multi-body system dynamics, non-linear systems, control systems, real-time applications, vehicle dynamics, tire-road interaction models, powertrain and brake system models, vibration control, acoustics. Techniques to characterise the driver/passenger perception will be adopted: questionnaires will be proposed and physiological reactions will be measured.</p>
Educational objectives	<p>The challenges that the candidate will have to face are both theoretical and experimental:</p>



	<ul style="list-style-type: none"> - develop hi-fi models for components like tires (including surface temperature effect, interaction with wet surfaces), suspensions, engine/powertrain, brakes, actuators, sensors like lidars, cameras; - develop innovative ADAS possibly based on a sensor-fusion approach that are able to exploit V2X communication; - develop control algorithms for automated driving possibly based on a sensor-fusion approach that are able to exploit V2X communication; - objectively evaluate drivers' reactions and upgrade/tailor the settings of the control systems accordingly.
Job opportunities	<p>Being the research carried out with the state-of-the-art of driving dynamic simulators, the primary job opportunity will be in the automotive field. Automobile industries and companies providing components (brake systems, suspensions, powertrain). Besides this, job opportunities will be with national and international academic and non-academic 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 to Master of Science holders in the same field.</p>
Composition of the research group	2 Full Professors 1 Associated Professors 0 Assistant Professors 0 PhD Students
Name of the research directors	Proff. Gobbi, Melzi, Sabbioni

Contacts
<p><i>Phone:</i> +39 2399 8417</p> <p><i>E-mail:</i> massimiliano.gobbi@polimi.it, edoardo.sabbioni@polimi.it, stefano.melzi@polimi.it</p> <p>For questions about scholarship/support, please contact phd-dmec@polimi.it.</p>

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	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>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.</p> <p>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. 700 euro/month- net amount).</p> <p>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.</p>