



# PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

**THEMATIC Research Field: COOPERATIVE CONNECTED 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

Autonomous driving will be among the goals of the 2030 agenda inspiring European and international partnerships and falling under Sustainable Development Goals 11, 12 and 17.

Cooperative, Connected and Automated Mobility (CCAM) responds to one of the mega-trends identified by the European Commission for 2030: connectivity. As cited by the Commission, by 2030 almost all European vehicles will be connected to the Internet and, therefore, connected to each other as part of a network and not as individual entities.

In this sense, PhD research will be oriented toward SDG number 11 with the aim of contributing to the functioning of smart cities by making them sustainable and promoting a reorganisation of city spaces reserved for mobility.

The CCAM partnership addresses the need to develop a research network appropriate for autonomous driving. The aim is to make it possible to achieve results relevant to the wide market take-up by getting concrete feedback.

The value of this partnership finds its place in SDG number 17 by wanting to develop European and international links to optimize research and development.

Autonomous driving optimises the vehicle and its functionality by improving its fuel economy, travel time and safety.

Autonomous vehicles, in conclusion, can help structure a production chain and mobility that reduce our ecological footprint, contributing to the achievement of Goal number 12 of the 2030 Agenda.



	<p>Given the above, the PhD research will aim to the following objectives:</p> <ul style="list-style-type: none"> <li>- understanding and applying EDGE technology for cooperation and connection between autonomous vehicles in a roundabout scenario;</li> <li>- studying the interaction between autonomous and humanly driven vehicles by understanding driver behaviours and models, city traffic flows, and enabling transitional mobility between full human and fully autonomous driving;</li> <li>- sensing forces acting at vehicle wheels in order to describe the domain of attraction for vehicle motion;</li> <li>- creating an autonomous driving policy that is effective both in meeting technical needs and adapting in interacting with humans in terms of comfort and safety;</li> <li>- conducting tests and experimental simulations at the driving simulator of the Politecnico di Milano (DriSMi) in order to reach the creation of a road prototype through collaboration with Automotive Companies;</li> <li>- collaboration with multiple stakeholders including universities and companies.</li> </ul>
Methods and techniques that will be developed and used to carry out the research	<p>Methods and techniques:</p> <ul style="list-style-type: none"> <li>- use of the driving simulator of the Politecnico di Milano (DriSMi);</li> <li>- optimization methods such as Deep Reinforcement Learning and neural networks;</li> <li>- measurements in a real city environment;</li> <li>- study of information flows to and from the vehicle;</li> <li>- simulation environment management, data acquisition and analysis using Python, Matlab, Simulink and VI-car.</li> </ul>
Educational objectives	<p>The Doctor in Mechanical Engineering will be able to carry out original research by working in a team. Both theoretical and experimental skills will be fostered. The research group will provide doctoral candidates with high-level scientific training, fostering and refining research and problem-solving abilities.</p>
Job opportunities	<p>Our last survey on MeccPhD Doctorates highlighted a <b>100% employment rate</b> within the first year and a <b>35% higher salary</b>, compared to Master of Science holders in</p>



	<p>the same field.</p> <p>Specifically, the skills and expertise developed during the PhD will allow covering positions for design and integrity assessment of advanced systems and components in automotive and mechanical companies involved in the green transformation.</p>
<b>Composition of the research group</b>	2 Full Professors 2 Associated Professors 1 Assistant Professors 7 PhD Students
<b>Name of the research directors</b>	Prof. Gianpiero Mastinu

<b>Contacts</b>
<p><i>Prof. Gianpiero Mastinu:</i> gianpiero.mastinu@polimi.it</p> <p>For questions about scholarship/support phd-dmec@polimi.it</p>

<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>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<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</p>



by the regulations.