



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

**PNRR 117 Research Field: REVOLUTIONIZING MECHATRONIC PRODUCT DEVELOPMENT:
EXPLORING INNOVATIVE MANUFACTURING AND ASSEMBLY PROCESSES**

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**

In automotive sector in light of recent and forthcoming challenges, there is an increased need to reevaluate and transform the design and production processes, with the aim of exploring novel concepts for both standard mechanical components and entirely new components. In this the Industry 4.0 scenario, additive manufacturing (AM) technologies and advanced manufacturing and assembly processes play a fundamental role. The objective of the research involves the investigation of alternative manufacturing and assembly processes not traditionally utilized at Brembo. Methodologically, the consideration will not be limited to the replacement of technologies but will include a circular approach that encompasses both the design phase and subsequent stages of use, disposal, and recycling. One of the most significant alternatives to conventional manufacturing and assembly processes that will be explored is the utilization of additive manufacturing technology and advanced manufacturing/assembly processes. Indeed, additive manufacturing (AM) will not be regarded as a standalone group of technologies, but rather as an integral part of a production process that encompasses other advanced solutions, such as the assembly process of a component incorporating electronic and hydraulic parts. The final outcome of the research is an innovative methodology that, starting from an integrated design, will assess a new technology route in the production of lighter, more reliable, and sustainable products.



<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research methodology adopts a holistic approach to evaluate design, process, and assembly alternatives. It begins with the definition of pertinent cases pertaining to Brembo powertrain products and technology. By analyzing current product requirements and identifying issues and failure modes, the exploration of new additive manufacturing (AM) and advanced processes is pursued. Subsequently, the selection of a preferred concept enables the design, validation, and evaluation of the chosen concept using dummy samples, followed by testing with real components. This methodology aims to comprehensively understand the limitations of current products, explore emerging technologies, and validate proposed concepts.</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. A PhD in Mechanical Engineering will be able to layout, draft and carry on original research.</p>
<p>Job opportunities</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> <p>List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:</p> <ul style="list-style-type: none"> •Brembo (www.brembo.com) •University of Cambridge •TU Munich •University of Twente •Cranfield University
<p>Composition of the research group</p>	<p>1 Full Professors 1 Associated Professors 1 Assistant Professors 5 PhD Students</p>
<p>Name of the research directors</p>	<p>Prof. Barbara Previtali, prof. Nora Lecis</p>



Contacts
<p>Phone: +390223998530 Email: barbara.previtali@polimi.it https://www.mecc.polimi.it/ricerca/sezioni/tecnologie-meccaniche-e-produzione/</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

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	BREMBO S.p.A.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Centre for Additive Manufacturing, University of Nottingham
By number of months abroad	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>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>