



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

THEMATIC Research Field: SMART ADDITIVE MANUFACTURING

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 fourth industrial revolution (namely Industry 4.0) and European starting plans (Horizon and NextGenerationEU), with their strategic orientations for EU research and innovation, calls for accelerating the twin (i.e., green and digital) transition. A paradigm shift to address various challenges including digital production, big data analysis and artificial intelligence, global production sustainability and circular economy, climate changes and smart cities is required.

In this framework, smart additive manufacturing refers to a set of key enabling technologies for providing high-precision, high-value, high-performance, and custom-designed components at minimum waste.

The research activity carried out with this scholarship can specifically focus on one or more subtopics within these main research frameworks:

- *Additive manufacturing processes*

Additive manufacturing represents a key technological platform where green and digitalized production can be pursued. Research at this level can concern new process development, development of new additive manufacturing capacities for innovative and challenging materials as well as innovative hybrid solutions conception.

- *Smart process monitoring, inspection, and control*

Smart solutions for sensing and inspection and innovative strategies for intelligent data fusion, big data analysis, quality process monitoring, control and inspection are key factors to achieve sustainable zero-defect additive manufacturing.



	<p>- <i>3D bioprinting</i></p> <p>In the field of innovative manufacturing processes, 3D bioprinting represents a cutting-edge additive manufacturing technology where cells and biomaterials are simultaneously deposited in a layer-by-layer manner to generate biologically active 3D tissues of predesigned shape and size. The development of advanced manufacturing capabilities combined with novel smart (monitoring, inspection, control) solutions are needed to push the application boundaries of this revolutionary approach.</p>
Methods and techniques that will be developed and used to carry out the research	<p>Rigorous experimental methods, physical models, and numerical simulations will be combined to design, implement, and validate the innovative solutions proposed.</p> <p>Team-working will be stimulated with the aim of providing appropriate solutions to actual challenges, which require multidisciplinary skills.</p>
Educational objectives	<p>Doctoral candidates will acquire competences on design, optimisation, and sensing/controlling of new advanced manufacturing processes and systems, as well as on measurement and characterization of innovative products.</p>
Job opportunities	<p>Italy and Lombardy Region have leading positions in manufacturing worldwide. 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>Institutions, Agencies and Companies that are cooperating in the research are: MIT - Massachusetts Institute of Technology, TUM - Technical University of Munich, ESA - European Space Agency, Shanghai Jiao Tong University, Georgia Tech University, STIIMA - CNR, ATV S.p.A., Ansaldo Energia S.p.A., Avio Aero, BLM Group, GE Avio S.r.l., Camozzi Group, Caracol, Leonardo - AugustaWestland S.p.A., Lima Corporate, Marposs S.p.A., Prima Industrie S.p.A., Tenova S.p.A.</p>
Composition of the research group	<p>4 Full Professors</p>



	3 Associated Professors 6 Assistant Professors 18 PhD Students
Name of the research directors	Proff. Colosimo, Matta, Moroni, Previtali

Contacts
<p>Names of Research Directors:</p> <ul style="list-style-type: none"> - Prof. Bianca Maria Colosimo - Prof. Andrea Matta - Prof. Giovanni Moroni - Prof. Barbara Previtali <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>