



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

THEMATIC Research Field: ZERO DEFECT 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, advanced, smart, and sustainable manufacturing processes and systems act as key enabling technologies for providing high-precision, high-value, and high-performance 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:

- *Smart process monitoring and inspection*

Smart solutions for in-situ monitoring and measurements and innovative strategies for intelligent data fusion, big data analysis, automated defect detection, control and inspection as key factors to achieve sustainable zero-defect additive manufacturing

- *Novel sensing solutions*

Investigation of novel methods in terms of in-line and in-situ data acquisition for enhanced data quality and resolution, aiming to overcome the limits of solutions and methods currently adopted at industrial level.

- *Process qualification and optimization*

Innovative solutions for efficient process and product



	qualification leveraging on big data gathered during the layerwise production, as well as optimization of process parameters and scan strategies to enable first-time-right production capabilities. The industrial framework will focus on the production of high value added parts in the aviation sector via smart powder bed fusion.
Methods and techniques that will be developed and used to carry out the research	Rigorous experimental methods, physical models, and numerical simulations will be combined to design, implement, and validate the innovative solutions proposed. Team-working will be stimulated with the aim of providing appropriate solutions to actual challenges, which require multidisciplinary skills.
Educational objectives	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.
Job opportunities	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. Universities, Agencies and Companies that are cooperating in the research are: GE Avio Aero, GE Additive, GE Aerospace, MIT - Massachusetts Institute of Technology, TUM - Technical University of Munich, ESA - European Space Agency, Shanghai Jiao Tong University - SJTU, Georgia Tech University.
Composition of the research group	5 Full Professors 3 Associated Professors 6 Assistant Professors 30 PhD Students
Name of the research directors	Prof.ssa Bianca Maria Colosimo

Contacts

For questions about scholarship/support, please contact phd-dmec@polimi.it.



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
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. 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). 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.