POLITECNICO DI MILANO

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

## THEMATIC Research Field: ADVANCED, SMART, AND SUSTAINABLE MANUFACTURING

| Monthly net income of PhDscholarship (max 36 months) |
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| **€ 1400.0**<br>In case of a change of the welfare rates during the three-year period, the amount could be modified. |

| Context of the research activity | |
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| **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 is required to address various challenges including digital production, big data analysis and artificial intelligence, global production sustainability and circular economy, climate changes and smart cities. 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:<br><br>*- Advanced manufacturing processes*<br>Among others, additive manufacturing for metals, ceramics, polymers, and biomaterials, micro-manufacturing, and laser-based technologies are the available technological platform where production digitalisation and self-consciousness can be pursued. Research at this level can concern new process development as well as innovative hybrid solutions conception.<br><br>*- Smart process monitoring, inspection, and control*<br>Smart solutions for sensing and inspection and innovative |

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| | strategies for intelligent data fusion, big data analysis, quality process monitoring, control and inspection are key factors to achieve sustainable zero-defect manufacturing.<br><br>*- Advanced manufacturing systems*<br>Innovative solutions for configuring and managing manufacturing systems are eventually needed to drive the whole production system toward smart, high-performance, and sustainable solutions. |
| **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. |
| **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.<br><br>Universities, Institutions and companies 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 www.stiima.cnr.it, ATV S.p.A., Ansaldo Energia S.p.A., Avio Aero, BLM Group, GE Avio s.r.l., Leonardo - AgustaWestland S.p.A., Lima Corporate, Marposs S.p.A., Prima Industrie S.p.A., Tenova S.p.A., COMAU S.p.A. |
| **Composition of the research group** | 4 Full Professors<br>3 Associated Professors<br>6 Assistant Professors<br>19 PhD Students |
| **Name of the research directors** | Proff. Colosimo, Matta, Moroni, Previtali |

| Contacts |
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| *Names of the Research Directors:*<br><br>*Prof. Bianca Maria Colosimo*<br><br>*Prof. Andrea Matta*<br><br>*Prof. Giovanni Moroni*<br><br>*Prof. Barbara Previtali*<br><br>For questions about scholarship/support phd-dmec@polimi.it |

| Additional support - Financial aid per PhD student per year (gross amount) | |
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| **Housing - Foreign Students** | -- |
| **Housing - Out-of-town residents (more than 80Km out of Milano)** | -- |

| Scholarship Increase for a period abroad | |
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| **Amount monthly** | 700.0 € |
| **By number of months** | 6 |

| Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information |
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| 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.<br><br>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).<br><br>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. |