



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

**THEMATIC Research Field: ADVANCED MODELLING AND TESTING OF MATERIALS AND  
STRUCTURES UNDER EXTREME LOADING CONDITIONS**

**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**

Working in the Machine and vehicle design group requires motivation in developing experimental and computational methods for the assessment of the structural integrity and advanced design of mechanical components and vehicles. The objectives of the research may range from the definition of new models of materials behaviour to the assessment of the structural integrity of large structures, from the experimental investigation on new materials to the design of structures, systems, components, and transportations with innovative features, with special focus on extreme loading conditions. This is a scenario characterized by multiphysics, multiscale problems that may require innovative modelling approaches not limited to the standard non-linear numerical methods. The researcher's activity is then set in a highly interdisciplinary context, appropriately intersecting various branches of engineering related to expertise's of Machine and vehicle design group: e.g., material behaviour and structural integrity under several loading conditions including (but not limited to) extreme loading conditions (e.g., impulsive loading like impacts and blast) and as well as innovative modelling and design approaches including survivability approaches. Applications may be in, but not limited to, the field of Defense and Security and transportations (naval, aerospace, terrestrial).

**Methods and techniques that will be  
developed and used to carry out the  
research**

Depending on the specific research topic assigned, methods and techniques will comprise finite element



	methods and techniques will comprise finite element modelling, boundary element modelling, computation fluid dynamic, inverse method for material calibration, fracture mechanics, low and high velocity impact on structures, impulsive loads, blast loading, survivability analyses, fatigue tests on specimens or on parts, non-destructive tests, high temperature tests, residual stress tests, tests on components, etc.
<b>Educational objectives</b>	The Doctor in Mechanical Engineering will be able to define, start and carry out original research by working in a team or leading a research group. Both theoretical and experimental skills are mastered. We provide doctoral candidates with high-level scientific training, fostering and refining research and problem-solving abilities.
<b>Job opportunities</b>	Job opportunities may be found in structures/organizations aimed at innovation and/or research and technical development, high-tech SMEs, government departments ruling on public needs. 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. Specifically, the skills and know-how developed during the PhD will allow to cover positions for design and integrity assessment of advanced systems and components in aerospace, automotive and mechanical companies involved in the green transformation.
<b>Composition of the research group</b>	1 Full Professors 3 Associated Professors 2 Assistant Professors 16 PhD Students
<b>Name of the research directors</b>	Prof. Marco Giglio, Prof. Andrea Manes

<b>Contacts</b>
<p>Prof. Andrea Manes <i>E-mail</i> andrea.manes@polimi.it</p> <p>Prof. Marco Giglio <i>E-mail</i> marco.giglio@polimi.it</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

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>