POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

THEMATIC Research Field: STRUCTURAL PROPERTIES OF AM MATERIALS

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 full exploitation of new lightweight alloys for AM 3D printing is challenged by the presence of manufacturing anomalies. Therefore, structural integrity assessment of 3D printed components is the open point for the application of new manufacturing techniques to critical components. It is especially important to verify the structural properties of new AM materials (e.g. Scalmalloy), where the mechanical properties can be improved by the addition of strengthening phases, considering the presence of manufacturing defects.
Methods and techniques that will be developed and used to carry out the research	The activity will be initially devoted to the analysis of new materials being developed within current research projects, aiming at determining the prospective applications and the structural properties of demonstrator components. The analysis will be based on fracture-based static and fatigue assessment to compare new materials being developed with the current materials, especially for discussing the defect acceptability. The activity after the first year will be devoted to enlarge the database of fatigue properties for materials relevant for AM applications, with a research directed to: i) application to aeroengines (also high temperature alloys); ii) application to space components.
Educational objectives	The main educational objective of the position is to setup new techniques for critically evaluating the structural

	properties of 3D printed parts, in relation to the manufacturing quality requirements. This goal can be pursued by properly combining specific fracture-based assessment with an experimental analysis of the mechanical response of the material and damage analyses.
Job opportunities	A recent survey showed that PhD candidates are 100% employed after one year, in national and international companies and academic and non-academic research institutions, engaged in innovation, research and technical development. On average the survey showed that people earning our PhD title obtain 35% higher salary than the corresponding employers with a Master of Science degree. Relevant companies for job positions are: European Space Agency, Avio-Aero, Rivalta, BEAMIT (PR), Thales Alenia Space.
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 5 PhD Students
Name of the research directors	Prof. Stefano Beretta, Prof. Luca Patriarca

Contacts
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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.