POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 38th cycle

Research Area n. 1 - Advanced Materials and Smart Structures

PNRR_352 Research Field: METHODS FOR NI AND CO-BASED SUPERALLOYS DAMAGE ANALYSIS AND SERVICE LIFE ASSESSMENT: STATE OF THE ART SURVEY AND DEVELOPMENT/TESTING OF NEW METHODOLOGIES

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	In the field of high-temperature materials one way to increase the material efficiency is extending their service life, limited by microstructural modifications referred as material damage. Proper methodologies can well predict service exhaustion by material damage on the basis of multiple analyses of parts. The objective of the thesis is the development of a methodology for damage evaluation and service life prediction to be easily implemented at industrial level by the project partner to Ni or Co-based superalloys. The PhD project is coherent with Mission 4C2 of PNRR (since it favours the applied research in synergy between Universities and Companies) and M1C1 (digitalization, innovation and competitiveness of the production system).
Methods and techniques that will be developed and used to carry out the research	The PhD student will carry out a detailed survey on damage forms, damage development and methodologies to predict damage development and service life exhaustion of Ni and Co- based superalloys. In a second stage of the PhD will focus on the development of a methodology based on multi-level approach, including material and material damage characterization, material-processing-properties correlations and their analyses. The initial focus will be on a reference alloy for which

	experimental data are available for project partner, possibly adding up new specific innovative material tests. The proposed methodology will be validated on another material.
Educational objectives	At the end of the PhD cycle the candidate will be able to define, design and carry out original research programs by working in a team or leading a research group in the field of high-performance materials. Educational activities during PhD will include research management, exploitation of research results and intellectual property.
Job opportunities	Job opportunities are foreseen at national and international academic institutions, high-tech companies and SMEs involved in innovation and technical development, specifically where high-performance materials are applied. 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. The PhD student will cooperate with institutions such as CNR, TU Graz, OVG Magdeburg as well as other Institutions and Companies related to the project partner.
Composition of the research group	2 Full Professors 2 Associated Professors 2 Assistant Professors 4 PhD Students
Name of the research directors	Prof. Elisabetta Gariboldi

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

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Nuovo Pignone Tecnologie S.r.l.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Graz University of Technology
By number of months abroad	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, fundingfor participation in courses, summer schools, workshops and conferences) for a total amount of euro 5.707, 13.

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.