



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 37th cycle

Research Area n. 1 - Advanced Materials and Smart Structures

**PON - GREEN Research Field: THERMOMECHANICAL APPLICATION OF LIGHTWEIGHT
LATTICE STRUCTURES WITH POTENTIAL FOR CARBON DIOXIDE EMISSIONS MITIGATION**

Monthly net income of PhDscholarship (max 36 months)
€ 1325.00
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	<p>Micro-lattice materials represent nowadays a great opportunity for developing new ultra-lightweight materials. Design flexibility and multi-functional properties make them attractive for several applications in automotive, space, aerospace and process industries. Moreover, the versatility offered by 3D printing allows almost unlimited shapes to be produced, leading to a more efficient mass and heat transfer. An efficient use of these materials presents a significant opportunity for the mitigation of carbon dioxide emissions by developing innovative enhancements for heat transfer, and reducing equipment size, mass and cost. In this scenario, predict fatigue resistance and defect acceptability of these micro-structures under thermo-mechanical loads is a key issue.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The focus will be on developing fatigue criteria, defect acceptability criteria and quality control procedures using non-destructive measurement methods, CT scan or Direct Control Potential Drop (DCPD). The developed techniques will be applied to compact and light heat exchangers obtained by Additive Manufacturing for space and aircraft applications and to a structured adsorber and catalytic reactor with Periodically Ordered Cellular Structures (POCS) for Carbon Capture and Usage (CCU) processes. Part of the activities will be carried out at GE</p>



	Avio where the fatigue criteria and the quality control procedures will be used for the design and the fatigue assessment of innovative lattice-based heat exchangers.
Educational objectives	The main educational objective of the position is to set up new techniques for the fatigue assessment of 3D printed lattice parts under thermo-mechanical loads. This goal will be pursued by properly combining numerical/analytical tools with experimental tests and damage analyses.
Job opportunities	Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary, compared Master of Science holders in the same field. Several Institutions are cooperating in the research. Among others: GE AVIO, European Space Agency (ESA), INSA Lyon.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 2 PhD Students
Name of the research directors	Prof. Stefano Foletti

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	566.36 €
By number of months	6

National Operational Program for Research and Innovation

Company where the candidate will attend the stage (name and brief description)	GE Avio 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)	INSA (Institut National des Sciences Appliquées) Lyon



By number of months abroad	6
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Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Funding for educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences); funding per PhD student per year: 2nd year: euros 1.534 3rd year: euros 1.534. Teaching assistantship: availability of funding in recognition of support to teaching activities by the PhD student; 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. **Computer availability:** 1st year: individual use 2nd year: individual use 3rd year: individual use. **Desk availability:** 1st year: individual use 2nd year: individual use 3rd year: individual use.