POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 41st cycle

THEMATIC Research Field: INNOVATIVE STRUCTURAL HEALTH MONITORING APPROACHES THROUGH SMART MATERIALS

Monthly net income of PhDscholarship (max 36 months)
1500.0 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	Objective: develop a new and innovative structural health monitoring (SHM) method relying on the use of smart materials, such as, e.g., piezoelectric materials, shape memory alloys (SMA), characterized by scalability, robustness and which can be potentially applied to different structures thanks to its general formulation. Works in the literature have already shown the capability of smart materials to provide significant advantages in terms of non-sensitivity to disturbing effects, such as, e.g., temperature.Taking advantage of these SHM methods based on others smart materials, the new one is expected to be as robust as possible to environmental and operational variations. Moreover, a significant advantage expected from the new method is that it can work in structures of different size. Resulting in a scalable technique applicable to different systems and, thus, general. Finally, the special features of smart materials are expected to reduce/avoid the need of artificial intelligence for reaching the goal, simplifying its use, and making it suitable for several systems as it is, without the need of significant changes.
Methods and techniques that will be developed and used to carry out the research	The candidate is expected to develop a method based on a modal model of the coupled system to demonstrate the general validity of the approach. At first, a simple structure will be considered in order to develop an analytical formulation of the method. Then, more complex structures will be considered, and their analysis will be carried out

	will be considered, and their analysis will be carried out through numerical simulations (e.g., finite element simulations). Finally, experimental validation will be performed, thus requiring skills in measurement science. The candidate is expected to be skilled in coupled systems, analytical modelling, and smart materials.
Educational objectives	•Master dynamics of coupled systems •Have analytical understanding of coupled structures •Develop knowledge in the field of structural health monitoring •Master experimental techniques for carrying out experimental activity in structural health monitoring applications.
Job opportunities	List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research: University of Genoa, University of Parma
Composition of the research group	3 Full Professors 5 Associated Professors 3 Assistant Professors 10 PhD Students
Name of the research directors	Prof. Stefano Manzoni

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
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 6.114,50.
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. 750 euro/month- net amount). Additionally, PhD candidates who spend at least 3 months abroad are eligible for an extra reimbursement of €3,000 to cover travel expenses.
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.