POLITECNICO DI MILANO

PhD in INGEGNERIA STRUTTURALE, SISMICA, GEOTECNICA / STRUCTURAL SEISMIC AND GEOTECHNICAL ENGINEERING - 40th cycle

THEMATIC Research Field: DIGITAL TWIN OF MEMS STRUCTURES

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	Continuous growth of complexity of microsystems provides motivation to research efforts in the direction of the development of so-called data-driven strategies. The available data collected in experimental campaigns and on-purpose generated ones by numerical simulations can be exploited to build a digital model. By pursuing the idea of hybridizing the models to account for physical principles ruling the problems on one side, patterns in the data can be better recognized. The activities to be carried out are inspired by this approach to the problem, in order to better match the known features of MEMS response and also guarantee a computational efficiency.The theoretical study will be followed by an adaptation of existing codes/models to the problem under study. The final result is expected in the field of optimization and testing of a family of neural network architectures, able to learn the main features of the MEMS behavior.
Methods and techniques that will be developed and used to carry out the research	Computational mechanics: multi-physics and, possibly, multi-scale approaches to model the effects of the microfabrication process on the response of MEMS devices; stochastic methods to account for the statistics related to the said production process.Machine learning: strategies to learn the device behavior based on measured or modeled data.
Educational objectives	The research field is across mechanical, materials and

	The research field is across mechanical, materials and structural engineering. Hence, Ph.D. students are expected to develop a multidisciplinary approach to the analysis of MEMS devices, in relation to the coupled multi-physics of the problem at hand.
Job opportunities	The collaboration with a major player in the field of microelectronics allows to get exposed to real-life situations. Job opportunities are therefore expected in this specific field, knowing that in Milan other main players already have an R&D division. Other opportunities can be in firms working to provide instrumentation and facilities to allow the mass production of tiny, cheap devices.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 0 PhD Students
Name of the research directors	Stefano Mariani

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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	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): financial aid per PhD student per year The Ph.D. course supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year.

Teaching assistantship: availability of funding in recognition of support to teaching activities by the PhD studentThere are various forms of financial aid for activities of support to the teaching practice.The PhD is encouraged to take part in these activities, within the limits allowed by the

regulations.

Computer availability: each Ph.D. student has his/her own computer for individual use.

Desk availability: each Ph.D. student has his/her own desk, cabinet and locker.