



PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 38th cycle

**INTERDISCIPLINARY Research Field: 'SMART DAMPER', VISCOUS DAMPER WITH
ADAPTIVE BEHAVIOR FOR THE SEISMIC PROTECTION OF CONSTRUCTIONS**

Monthly net income of PhDscholarship (max 36 months)

€ 1275.0

In case of a change of the welfare rates or of changes of the scholarship minimum amount from the Ministry of University and Research, during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Interdisciplinary PhD Grant

The PhD research will be carried out in collaboration with research groups of the PhD programme in "**MATERIALS ENGINEERING**".

See <https://www.dottorato.polimi.it/?id=422&L=1> for further information.

Supplementary energy dissipation is a modern seismic mitigation technique for the protection of constructions from the effects of earthquakes. The technique is based on the introduction, within the structural assembly, of suitable devices (called 'dampers'), wherein the dissipation of most of the earthquake energy is concentrated, thus safeguarding the structural elements committed to supporting gravitational loads. Among the most common devices today in use, both for buildings and for road infrastructures such as bridges and viaducts, there are the fluid dynamic dampers, which dissipate energy through the lamination of a viscous fluid that is forced to pass through channels of small section. The mechanical response of the dampers depends on the intensity of the seismic action, which determines the speed with which the viscous fluid is pushed in the channels. The dampers are typically designed with



	<p>reference to a design earthquake (or set of earthquakes), and provide the best performance in response to the seismic input, while their effectiveness is reduced in the presence of earthquakes with different characteristics. The proposed research aims to develop fluid dynamic dampers with adaptive behavior, whose mechanical response can be modified, even in real time, in order to adapt to the features of the particular seismic input and to provide optimal performance in response to different excitations in terms of intensity, frequency content, duration. The goal is pursued through the development of a fluid-dynamic damper that uses a fluid whose viscosity can change by several orders of magnitude as a function of an external electric or magnetic field, controlled automatically by a sensing system installed in the host structure.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research topic is highly multidisciplinary and requires the integration of skills in structural and seismic engineering, in material science and engineering, and in fluid dynamics.</p> <p>Methods that will be developed and used to carry out the research include structural monitoring, multiphysics modeling, experimental characterization of fluids, testing of damper prototypes, and seismic analysis and design of structures equipped with dampers.</p> <p>The research will make use of collaborations with the Department of Chemistry, Materials and Chemical Engineering (DCMIC) of Politecnico for the experimental characterization of the rheological behavior of Newtonian and non-Newtonian fluids also with electrorheological and magnetorheological characteristics, and for the study and optimization of the performance of dampers through their multiphysics simulation, and with the Materials Testing Laboratory of Politecnico for testing of prototypes of adaptive behavior dampers.</p>
<p>Educational objectives</p>	<p>The PhD programme aims at preparing researchers with the skills and aptitude to pursue multidisciplinary research in industries, research centers, or academic institutions, in the field of seismic protection of constructions. The PhD programme will also develop team working attitude and</p>



	will create opportunities for international collaborations.
Job opportunities	<ul style="list-style-type: none"> • R&D in industries manufacturing seismic protection systems • Structural designer in engineering firms • Researcher in research centers or universities
Composition of the research group	1 Full Professors 2 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Profs. V. Quaglini, F. Briatico Vangosa

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	637.5 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Additional support:</p> <p>Budget for the research activity: total amount Euro 5,197.62 per student In detail: - 1st year Euro 1,732.54 - 2nd year Euro 1,732.54 - 3rd year Euro 1,732.54</p> <p>Interdisciplinary cooperation: the PhD Candidate will benefit from initiatives organized by both PhD Programmes involved.</p> <p>Additional information can be found in the Regulations for the 38th Cycle of ABC-PhD:</p>



download is available at link:

<https://beep.metid.polimi.it/web/abcphd/documenti-e-media>

Additional information about ABC department and ABC-PhD programme:

available at link:

<https://www.dabc.polimi.it/>

Desk availability:

The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.