POLITECNICO DI MILANO

PhD in INGEGNERIA STRUTTURALE, SISMICA, GEOTECNICA / STRUCTURAL SEISMIC AND GEOTECHNICAL ENGINEERING - 39th cycle

PARTENARIATO PNRR Research Field: PHYSICS-BASED EARTHQUAKE GROUND MOTION SIMULATIONS FOR ADVANCED SEISMIC RISK ANALYSES

Monthly net income of PhDscholarship (max 36 months)
€ 1250.0 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	**RETURN: PARTENARIATO ESTESO MULTI-RISK SCIENCE FOR RESILIENT COMMUNITIES UNDER A CHANGING CLIMATE** CUP D43C22003030002 - Decreto di concessione D.D. 1552 del 11/10/2022 D.D. 341 del 15/03/2022 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di "Partenariati estesi alle università, ai centri di ricerca, alle aziende per il finanziamento di progetti di ricerca di base" - nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 "Istruzione e ricerca" - Componente 2 "Dalla ricerca all'impresa" - Investimento 1.3, finanziato dall'Unione europea - NextGenerationEU The proposed research work is framed in the activities related to spoke VS3 - Earthquakes and Volcanoes - of the RETURN Project (Partenariato esteso PE3). The candidate will contribute to the work package WP7 (Strategies for loss reduction based on a systemic approach).In such WP, a benchmark case study will be defined of an Italian metropolitan area subjected to several possible realizations of a "major" earthquake and to the subsequent seismic cluster of aftershocks. Physics-based numerical simulation of earthquake ground motion for such benchmark will be carried out and shaking maps for the mainshock and for the aftershocks will be

	produced. This will serve as an input for the seismic exposure and vulnerability models developed within other WPs of the project.
Methods and techniques that will be developed and used to carry out the research	The candidate will initially get confidence with the spectral element code SPEED (speed.mox.polimi.it), developed at Politecnico di Milano and suitable for high performance computing of seismic wave propagation in 3D complex geological environments, together with its pre- and post-processing tools. Then, simulations of earthquake ground motion from an historical earthquake will be performed, in order to validate the numerical model. Subsequently, different possible realizations of earthquakes in the selected area will be simulated, and fragility curves applied for the exposed systems at risk, in order to explore the variability of the impact of such earthquakes and the effectiveness of countermeasures.
Educational objectives	In the perspective of the RETURN Project, the candidate will be trained within the whole chain of seismic risk analysis, including hazard, vulnerability and exposure evaluations, since he/she will closely cooperate with the researchers and experts from different research units of the Project. His/her main field of expertise will become the physics-based simulations of earthquake ground motion, that is becoming one of the most promising approaches in alternative to more classical empirical ground motion prediction models. In tis framework, the candidate will get experienced with high performance numerical simulation tools, both for the development of new routines for pre- and post-processing and the application to complex case studies.
Job opportunities	The topics of the proposed PhD scholarship span different fields related to earthquake engineering, seismic hazard and risk evaluations. In this framework, there is a continuously growing need of expertise for both research and professional activities, that is hardly covered by standard educational programs of civil and environmental engineering.
Composition of the research group	1 Full Professors

	1 Associated Professors 0 Assistant Professors 3 PhD Students
Name of the research directors	Roberto Paolucci, Chiara Smerzini

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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	625.0 €
By number of months	6

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

Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research: Università di Napoli, Federico II; Università di Trieste; Osservatorio Geofisico Sperimentale di Trieste, Università di Roma, La Sapienza.

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): 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 assistanship (availability of funding in recognition of support to teaching activities by the PhD student): Ph.D. students are encouraged to apply, upon prior authorization, to the calls to support teaching activities at the undegraduate and Master levels at Politecnico, being paid for that. The teaching assistantship will be limited up to about 80 hours, maximum half of them devoted to teaching and classroom activities and the rest to support classworks and exams.

Computer availability and desk availability: Each Ph.D. student has his/her own computer for individual use.Each Ph.D. student has his/her own desk, cabinet and locker.