UNIVERSITA' DEGLI STUDI DI NAPOLI FEDERICO II

DIPARTIMENTO DI STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA
CORSO DI DOTTORATO DI RICERCA IN
INGEGNERIA STRUTTURALE GEOTECNICA E RISCHIO SISMICO

XXXIX CICLO

Il sottoscritto prof. GENNARO MAGLIULO

(PO □ **PA X** RU □ RTD □) afferente al Dipartimento di

S.S.D. (*indicare codice e nome per esteso)* ICAR/09 - Tecnica delle costruzioni

CHIEDE

di essere inserito tra i possibili tutor di studenti di dottorato per il XXXIX ciclo.

1. Curriculum sintetico del proponente (max 500 parole)

Gennaro Magliulo is Associate Professor of Structural Design at the Department of Structures for Engineering and Architecture (DIST) of University of Naples Federico II since 2018. He is qualified for Italian Full Professorship of "Structural Design" since 2019 and is affiliate researcher at the Construction Technologies Institute of the National Research Council since 2016. Prof. Magliulo was awarded PhD in Structural Engineering at University of Naples Federico II, discussing a thesis titled "Seismic behavior of RC frame buildings with plan irregularities" in 2001.

At DIST, prof. Magliulo teaches two master's degree courses: Precast Structures and Healthcare Facilities. He is currently tutor of a PhD student in the frame of the doctorate in Structural and Geotechnical Engineering and Seismic Risk at the University of Naples Federico II. Prof. Magliulo was tutor of ten PhD students, seven in the frame of the doctorate in Seismic risk at University of Naples Federico II, one in the frame of the doctorate in Engineering of Materials and Structures at the same university, and two in the frame of the doctorate in Environmental Phenomena and Risks at the University of Napes Parthenope. He also taught the course of Seismic Analysis of Buildings within the doctorate in Seismic Risk. He is currently member of the board of doctorate in Biology and Applied Sciences at University of Molise. Prof. Magliulo was tutor of more than 100 master's students in the frame of their thesis projects and supervised more than 50 final year internships.

Prof. Magliulo is author of 7 patents and more than 200 articles, and more than 50 of them were published in international peer reviewed journals. Prof. Magliulo is reviewer for several international peer reviewed journals, is member of the editorial board of Bulletin of New Zealand Society for Earthquake Engineering and currently editor of a special issue to be published by the Journal of Earthquake Engineering on Seismic Performance of Nonstructural Elements and Systems. His research concerns earthquake engineering and dynamics of structures, nonstructural components, RC structures and precast structures, in the fields of theoretical modelling, numerical analysis, experimental research and code activity.

Prof. Magliulo has been principal investigator of more than 20 international and national research projects, funded by either public or private entities. He is member of the board of ACI Italy Chapter and of "Seismic Performance Of Non-structural Element" association, and member of the fib committee TG 6.17 "Retrofitting and repairing of precast structures in seismic areas". He is also member of ACI and of the European Association of Earthquake Engineering.

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio

n. __2_____	*PhD Course in Structural and Geotechnical Engineering and Seismic Risk, University of Naples Federico II* • *TUOZZO FEDERICO - XXXVIII cycle* • *ZITO MARTINO - XXXV cycle*
n. __2_____	*PhD Course in Environmental Phenomena and Risks, University of Napes Parthenope* • *DI SALVATORE CHIARA – XXXIV cycle* • *PICCOLO VALERIA - XXXIV cycle*

3. Titolo della ricerca proposta

Seismic risk assessment of monumental and artistic heritage and development of innovative protection strategies

4. Area tematica

Ingegneria Geotecnica □

Ingegneria Strutturale X

Rischio Sismico X

5. Tipologia di borsa per la quale si propone il progetto

Ateneo X

DM 117 (Investimento 3.3) □
(in questo caso indicare l'azienda co-finanziatrice)

DM 118 (Investimento 4.1 P.A.) □

DM 118 (Investimento 4.1 generici) □
DM 118 (Investimento 4.1 Patrimonio culturale) X

6. Sintesi del progetto di ricerca (max 500 parole. Stato dell'arte, obiettivi e breve programma previsto per le attività e)

In the last two decades, several studies assessed the seismic vulnerability and risk of monumental and artistic heritage [1], and in some cases, seismic protection strategies were developed [2]. However, the state-of-the-art on the seismic risk associated with the abovementioned facilities and critical contents is still in an early state of development. Furthermore, most seismic protection strategies and techniques were applied considering specific case studies, difficultly extendable to different scenarios.
The proposed research project is motivated by the abovementioned criticalities, and this is further stressed by the high seismic risk associated with the Italian heritage. The PhD proposal has two aims: (a) critical assessment of the seismic risk of representative Italian (and worldwide) case studies and (b) development of innovative seismic protection strategies/techniques. The methodology of investigation will include (a) observational and post-event analysis, (b) numerical methods, and (c) experimental testing. (a) The existing literature and associated databases will be critically analyzed, collecting and organizing the data within electronic databases, easily accessible by researchers, practitioners, and stakeholders. (b) Numerical simulations will be carried out considering multiple methods

(rigid block analysis [3] and finite element analysis (FEM) [4]). (c) Shake table testing [5] will be carried out considering representative suites of real ground and floor motions, as well as robustly developed artificial inputs, i.e., derived according to the most referenced testing and qualification protocols.
The case studies of interest will be selected by carrying out a field study at the National Archeological Museum of Naples (MANN), in the framework of the research period of the PhD. The case study and objectives of the study will be technically defined according to the perspectives of MANN, possibly maximizing the social and cultural impact.
The research methods and results will be strengthened and validated during the research period abroad, among internationally recognized universities, and the co-supervision of academic experts.
The PhD will develop a unique academic/professional profile, able to address theoretical, numerical, experimental, and practical issues, by implementing an organic/systematic approach. Through the research periods at MANN and abroad, the PhD will develop technical/soft skills particularly significant to engineers/researchers.

References

1. Neurohr T, McClure G. Shake table testing of museum display cases. Canadian Journal of Civil Engineering 2008; 35(12): 1353–1364. DOI: 10.1139/L08-084.
2. Baggio S, Berto L, Favaretto T, Saetta A, Vitaliani R. Seismic isolation technique of marble sculptures at the Accademia Gallery in Florence: numerical calibration and simulation modelling. Bulletin of Earthquake Engineering 2015; 13(9): 2719–2744. DOI: 10.1007/s10518-015-9741-2.
3. D'Angela D, Magliulo G, Cosenza E. Seismic damage assessment of unanchored nonstructural components taking into account the building response. Structural Safety 2021; 93: 102126. DOI: 10.1016/j.strusafe.2021.102126.
4. Papadopoulos K, Vintzileou E, Psycharis IN. Finite element analysis of the seismic response of ancient columns. Earthquake Engineering & Structural Dynamics 2019; 48(13): 1432–1450. DOI: 10.1002/eqe.3207.
5. Berto L, Di Sarno L, Fragiadakis M, Rocca I, Saetta A. Seismic assessment of free-standing artifacts: Full-scale tests on large shake table. Earthquake Engineering & Structural Dynamics 2023: eqe.3890. DOI: 10.1002/eqe.3890.

7. Eventuali pubblicazioni del tutor sul tema di ricerca (max 10)

- D'Angela, A., Magliulo, G., Cosenza, E., 2022. Incremental Dynamic Analysis of Rigid Blocks Subjected to Ground and Floor Motions and Shake Table Protocol

Inputs. Bulletin of the New Zealand Society for Earthquake Engineering 55. https://doi.org/10.5459/bnzsee.55.2.64-79

- D'Angela, D., Magliulo, G., Cosenza, E., 2021a. Seismic damage assessment of unanchored nonstructural components taking into account the building response. Structural Safety 93, 102126. https://doi.org/10.1016/j.strusafe.2021.102126
- D'Angela, D., Magliulo, G., Cosenza, E., 2021b. Towards a reliable seismic assessment of rocking components. Engineering Structures 230, 111673. https://doi.org/10.1016/j.engstruct.2020.111673
- Di Sarno, L., Magliulo, G., D'Angela, D., Cosenza, E., 2019. Experimental assessment of the seismic performance of hospital cabinets using shake table testing. Earthquake Engineering & Structural Dynamics 48, 103–123. https://doi.org/10.1002/eqe.3127
- Petrone, C., Di Sarno, L., Magliulo, G., Cosenza, E., 2017. Numerical modelling and fragility assessment of typical freestanding building contents. Bulletin of Earthquake Engineering 15, 1609–1633. https://doi.org/10.1007/s10518-016-0034-1
- Prota, A., Zito, M., D'Angela, D., Toscano, G., Ceraldi, C., Fiorillo, A., Magliulo, G., 2023. Dynamic Properties and Seismic Response of a Museum Display Case with an Art Object, in: Cimellaro, G.P. (Ed.), Seismic Isolation, Energy Dissipation and Active Vibration Control of Structures, Lecture Notes in Civil Engineering. Springer International Publishing, Cham, pp. 830–839. https://doi.org/10.1007/978-3-031-21187-4_72
- Prota, A., Zito, M., D'Angela, D., Toscano, G., Ceraldi, C., Fiorillo, A., Magliulo, G., 2022. Preliminary Results of Shake Table Tests of a Typical Museum Display Case Containing an Art Object. Advances in Civil Engineering 2022, 1–18. https://doi.org/10.1155/2022/3975958
- Zito, M., D'Angela, D., Maddaloni, G., Magliulo, G., 2022a. A shake table protocol for seismic assessment and qualification of acceleration-sensitive nonstructural elements. Computer aided Civil Eng mice.12951. https://doi.org/10.1111/mice.12951
- Zito, M., Nascimbene, R., Dubini, P., D'Angela, D., Magliulo, G., 2022b. Experimental Seismic Assessment of Nonstructural Elements: Testing Protocols and Novel Perspectives. Buildings 12, 1871. https://doi.org/10.3390/buildings12111871

8. Eventuali progetti di ricerca finanziati in cui l'attività si inserisce

- Research project PRIN "ENRICH: ENhancing the Resilience of Italian healthCare and Hospital facilities" (2022-2025), funded by MUR. National coordinator: Prof. Gennaro Magliulo.
- Research project "ReLUIS 2022-2024 WP17: Contributi normativi relativi a Componenti non strutturali" (2022-2024), funded by DPC and ReLUIS. Research unit coordinator (UNINA-Magliulo): Prof. Gennaro Magliulo.

9. Eventuali fondi disponibili a supporto dell'attività del dottorando (escluso finanziamento borse)

- Research project PRIN "ENRICH: ENhancing the Resilience of Italian healthCare and Hospital facilities" (2022-2025), funded by MUR. National coordinator: Prof. Gennaro Magliulo.
- Research project "ReLUIS 2022-2024 WP17: Contributi normativi relativi a Componenti non strutturali" (2022-2024), funded by DPC and ReLUIS. Research unit coordinator (UNINA-Magliulo): Prof. Gennaro Magliulo.

10. Informazioni relative ad un periodo di ricerca all'estero (minimo tre mesi) previsto per il dottorando (*indicare Università/ente di ricerca e docente/ricercatore di riferimento* con indirizzo mail) (max 300 parole)

The PhD course will include a period of six months of visiting research at an internationally recognized university, under the supervision of expert academics. In particular, Prof Magliulo collaborates with several international universities and research groups in the field of seismic assessment of structures and nonstructural elements, which would be potential hosts/co-supervisor in the framework of research period abroad for the PhD student. The following options would be suitable for arranging the abroad period of the PhD student.

- Prof. Gilberto Mosqueda, University of California San Diego (USA); gmosqueda@ucsd.edu. Prof. Mosqueda is among the most recognized experts in earthquake engineering, structural dynamics, and seismic assessment of structural and nonstructural elements.
- Prof. Rajesh Dhakal, University of Canterbury (New Zealand); rajesh.dhakal@canterbury.ac.nz. Prof. Dhakal is among the most recognized experts in the field of performance-based earthquake engineering, seismic assessment of nonstructural elements, and seismic losses.

- Dr. Marianna Ercolino, University of Greenwich (UK); m.ercolino@gre.ac.uk. Dr. Ercolino is a young researcher, expert in seismic assessment of structures and numerical modeling.

The research abroad will be carried out during the second year of the PhD course, and it will be aimed at deepening, extending, and validating the research activities implemented in the course of the first part of the PhD. Possibly, experimental activities will be carried out at the hosting university, according to the compatibility with the evolution of the studies.

11. Eventuali collaborazioni con imprese/aziende sul tema di ricerca (max 300 parole)

The PhD course will include a period of nine months of visiting research at the National Archaeological Museum of Naples (MANN). This research period will allow the PhD student to address the research topic with a robust reference to real and representative case studies, enriching the academic study with relevant field applications.
Prof. Magliulo collaborated with MANN in the framework of the following research project. Please, refer to the Section 7 for the publications developed in the framework of this collaboration.

- Convenzione di ricerca relativa a "Analisi, studio e approfondimento di tematiche tecnico-scientifiche legate alla messa in sicurezza dell'edificio museale e dei beni culturali in esso contenuti" (durata 18 mesi: 01/10/2019-31/03/2021). Ente finanziatore: Museo Archeologico Nazionale di Napoli (MANN). Responsabile tecnico e scientifico della Convenzione di Ricerca: Prof. Andrea Prota del Dipartimento di Strutture per l'Ingegneria e l'Architettura dell'Università degli Studi di Napoli Federico II, Paolo Giulierini del MANN.

The research at MANN will be carried out in the first part of the PhD course (e.g., during the first and second year); it will be aimed at (a) defining the case studies to investigate, (b) assessing the seismic risk associated with the case studies, and (c) identifying the criticalities in terms of seismic response.

Napoli, 27/06/2023 FIRMA