



POLITECNICO
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PhD School - Politecnico di Milano
Regulations of the PhD programme in:
Structural, Seismic and Geotechnical Engineering

Cycle XXXIII

Location: Milano Leonardo

1. General Information

PhD School - Politecnico di Milano

PhD programme: Structural, Seismic and Geotechnical Engineering

Start: November 2017

Location of the PhD programme: Milano Leonardo

Promoter: Department of Civil and Environmental Engineering

Subjects (SSD): ICAR/07 – Geotechnics
 ICAR/08 – Structural Mechanics
 ICAR/09 – Structural Engineering

PhD School Website: <http://www.polimi.it/phd>

PhD programme Website: <http://www.dica.polimi.it/en/dottorato>

2. General presentation

Structural, Seismic and Geotechnical Engineering (SSGE) encompasses those disciplines and techniques, deeply rooted in the field of Civil Engineering but with important industrial applications as well, which allow to understand, model and control the behaviour of structural materials, soils, buildings and the interaction between outdoor environment and construction. This is a highly inter-disciplinary field: the theoretical and applied study of materials and buildings goes along with the analysis of the interaction of the structure with the environment, ensuing from either natural or anthropic activities. Because of their generality in materials and structural modelling, the methods developed within the domain of SSGE are also very useful in other technical-scientific areas, whenever understanding and controlling mechanical aspects is necessary to guarantee both design reliability and structural safety, serviceability as well as durability.

The PhD course is headed by a Coordinator and a Faculty Board.

The Coordinator chairs the Faculty Board, coordinates the preparation of the annual Educational Programme and the organization of the educational activities of the PhD course (see Attachment A1).

The Faculty Board is responsible for the Educational programme and for teaching and administrative activities related to the PhD course (see Attachment A2).

3. Objectives

Within the context outlined above, the primary objective of this PhD programme is to improve the advancement of knowledge with reference to: (a) innovation in materials and structures; (b) safety of buildings and products under exceptional static or dynamic action effects or against the deterioration due to the structure lifecycle; (c) soil and surface/buried structure stability.

This objective is pursued within the framework of the research activities carried out at the Department of Civil and Environmental Engineering of Politecnico di Milano (for reference see the presentation available [here](#)). For this purpose, PhD candidates are given advanced, research-oriented training, based on the pivotal role of Structural Engineering and on the multi-disciplinary nature of Seismic and Geotechnical Engineering. More specifically, the 3-year curriculum of the PhD programme in Structural, Seismic and Geotechnical Engineering aims at providing the following professional skills that will be developed to a greater or lesser extent according to the interests of the candidate:

- (a) Basic and operative knowledge of the main, up-to-date methods used in computational mechanics, in order to model and analyze the elastic, inelastic and cyclic behaviour of materials, structures and soil.
- (b) Critical understanding and conscious use of numerical codes, depending on the level of the analysis (micro-, meso- and macro-structural levels).
- (c) Basic and operative knowledge of experimental mechanics, including the most up-to-date experimental techniques and their instrumentation, in order to test materials, structures and soil, either in a laboratory or on site.
- (d) Knowledge of the most common procedures for test-based identification of the parameters characterizing the mechanical properties of materials, soils and structural damage (for assessment of structural safety).
- (e) Basic and operative knowledge of the design criteria and socio-economic implications governing any major structural project.

4. Professional opportunities and job market

The high-level education offered by the PhD programme in Structural, Seismic and Geotechnical Engineering allows PhDs to continue their activity along three paths: (a) in the academic field; (b) within other public or private research institutions or companies with an outstanding trend for research and development; (c) professional activities (typically as an independent self-employed professional or high-level consultant, mainly in the field of advanced structural design and monitoring - Civil and Environmental Engineering and Industrial Engineering).

The inter-disciplinary approach of the PhD programme allows to exploit the experience gained during the study period in different areas: from the design of big infrastructures to the preservation and

restoration of monumental and architectural heritage, from seismic design to slope stability, not to mention the many issues in common with several branches of the Industrial Engineering (mechanical, aerospace, nuclear and bioengineering).

5. Enrollment

5.1 Admission requirements

Both Italian and international citizens can apply. They should have graduated in accordance with the pre-existing laws D.M. 3.11.1999 n. 509, or they must have been awarded: a) a Master of Science degree in accordance with D.M. 3.11.1999 n. 509, or b) a Master of Science in accordance with D.M. 22.10.2004 n. 270, or c) a similar academic title obtained abroad, equivalent for length and content to the Italian degree with an overall duration of university studies of at least five years.

The certified knowledge of the English language is a requirement for the admission. Please refer to the PhD. School website for more details.

Admission to the programme follows the evaluation of the candidates' curricula, their motivation letter and their report on the development of a hypothetical PhD research in one of the topics addressed in the call for admission.

5.2 Admission deadlines and number of vacancies

For the number of vacancies please see the call for admission to the 33rd PhD cycle programmes: <http://www.polimi.it/phd>

Scholarships both on general and specific topics are available, as stated in the call for admission.

6. Contents

6.1 Requirements for the PhD title achievement

The achievement of the PhD title in Structural, Seismic and Geotechnical Engineering requires study and research activities of at least three-year equivalent full time study, research and development of the PhD thesis.

The PhD in Structural, Seismic and Geotechnical Engineering requires at least 25 credits from PhD level courses to be earned as described in paragraph 6.3 below.

In addition, candidates should attend seminar activities organized by the Department, according to the rules defined by the Academic Board.

At the beginning of the course, the Faculty Board assigns a tutor to each PhD candidate to supervise and assist him/her for the overall training programme. The tutor should be a professor belonging to the Faculty Board. The tutors assist the candidates in the choice of the courses to be included in the study plan, which is then submitted for approval to the Coordinator and the Faculty Board of the PhD programme (see also section 6.4 below).

The Faculty Board may assign extra course credits to one or more candidates, if they need to focus on

specific topics, relevant for their research projects.

6.2 Research development

The main aim of all PhD programmes at Politecnico di Milano is the development of a research-oriented mind-set, as well as expertise and skills on specific research topics. To this end, candidates develop not only the capability to tackle problems in complex contexts, but they are also able to perform in-depth problem analysis, identify original solutions and evaluate whether they are applicable in practical contexts. These skills can be deployed both in the academic field and in public or private organizations. PhD candidates should develop an original research contribution, so that the PhD thesis increases the knowledge in their research field. Besides, it should be coherent with the research topics developed in the Department where the PhD programme is carried out.

The original research results are summarized in the PhD thesis, where the candidate's contribution is put in perspective with state-of-the-art of that research field.

The PhD research is developed under the guidance of a supervisor, who supports the candidate in the setting-out and in the everyday activities related to the thesis. The supervisor is not necessarily a member of the Board of Professors and could also belong to an institution other than Politecnico di Milano. The supervisor can be supported by one or more co-supervisors.

To develop their capability to carry out research activities, candidates must earn a minimum of 25 credits (from courses coherent with their PhD programme). A tutor, belonging to the Board of Professors, is appointed for each candidate admitted to the programme. The supervisor and the tutor could be the same person.

Tutors supervise and support the candidates during the entire training path. They assist the candidates in the choice of the courses to be included in the study plan, which must be approved by the Coordinator of the PhD programme.

Further activities intended to enhance the candidate's personal skills and research expertise are encouraged during the PhD path.

Candidates must acquire the capability to present and discuss their work in the research community. Consequently, both the participation to international conferences and the publication of the research results in peer-reviewed journals are fostered.

The PhD programme strongly recommends candidates work together with other groups in their research field, preferably abroad. Research visits of at least three months are strongly encouraged, since they help the candidates acquire further skills to develop their research work and thesis.

The programme usually lasts three years.

6.3 Objectives and general framework of the teaching activities

The PhD programmes and the PhD School activate teaching forms of different kind and credit value, including courses, seminars, project workshops, laboratories. Not only do teaching activities cover basic research issues (problems, theories, methods), which are the founding element of the PhD programme and clearly identify its cultural position, but they also offer a deep insight in a variety of research issues

connected with the critical issues arising in the theses.

Lessons are usually held in English, except when otherwise indicated. The PhD programme includes at least one complete path delivered in English.

Structured teaching activities allow to earn ECTS credits. Other activities, more specialized and difficult to evaluate, fall within those scientific activities which are taken into account by the Board of Professors for the overall evaluation but do not entitle to any ECTS.

The PhD School of Politecnico di Milano offers a set of courses aimed at training PhD candidates in soft and transferable skills, which will support the candidates to interact with different areas of their careers, in order to meet the rapidly evolving needs of the global economy and society at large.

The PhD School courses activated for the 2017 – 2018 Academic Year are summarized in the table below:

Course name	Professor
Ethics in Research	Andrea Aliverti
Ethics, Technology, and Society	Viola Schiaffonati
From Knowledge to Decision	Simona Chiodo
Public Engagement and Communication for Science and Research	Paolo Ciuccarelli
Sulla Responsabilità della Tecnica	Paolo Maria Ossi
Sociology of research	Paolo Volontè
Design thinking - management and production of ideas	Nicola Crea
Methods and models for the decision making	Alberto Colorni
Collaborative Research Methodologies	Rami Shani
Scientific Communication in English	Timothy J Sluckin
Advanced Interaction Skills for Academic Professionals	Michela Arnaboldi
Professional Communication	Nicoletta Di Blas
Science, Technology, Society and Wikipedia	Guido Raos
Disseminating Research	Anna Maria Paganoni
Research Skills	Donatella Sciuto
Research Planning	Tullio Tolio
Innovative Teaching Skills	Giulio Magli
Industrial Skills	Paolo Biscari
Project Management Basics	Alfonso Fuggetta
Project Management (in Action)	Mauro Mancini
Project Management PMI-CAPM Certification Preparation	Alfonso Fuggetta

At least 10 of the 25 course credits that each candidate is required to earn shall be obtained through soft and transferable skills courses organized by the PhD School.

The PhD programme in Structural, Seismic and Geotechnical Engineering boasts a group of professors continuously working on the educational aspects of the programme, in order to offer a wide choice of courses covering all the research areas involved in the programme every year.

EVALUATIONS

After attending a course, PhD students should pass an exam, whose form (oral, written test or written essay) will be defined by the end of the course by the professor in charge of it.

COURSE PROGRAMMES

For information about the course programmes (content and calendar) please see:

Politecnico On-Line Services:

<https://www11.ceda.polimi.it/manifestidott/manifestidott/controller/Main.do> (registration in AUnica is necessary to see the page)

PhD programme Website: <http://www.dica.polimi.it/en/dottorato/phd-course-in-structural-seismic-and-geotechnical-engineering/teaching-activities>

The table below summarize the candidate's activity plan (coursework). At the same time, candidates should also focus on research under the direction of their supervisor as well as of the Board of Professors.

First/Second Year

<i>Courses</i>	<i>Possible details or reference to following tables</i>	<i>Number of credits</i>	<i>Notes</i>
<i>PhD School Courses</i>	http://www.dottorato.polimi.it/en/during-your-phd/phd-school-courses	At least 10	- At the beginning of the year, PhD students submit their study plan, which is subject to the prior authorization of both the tutor and the Teaching Board.
<i>Courses characterising the PhD programme</i>	TABLE A	At least 15	- Changes of the study plan are allowed upon authorization of the Teaching Board.
<i>Other PhD courses</i>	Courses from other PhD programmes held at Politecnico or other universities		- Credits are earned only by passing the exam. - At least 15 credits (earned from Table A and/or Table B) are

		required to proceed into the second year.
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Third year

Candidates should devote their third year entirely to research and to the development of the PhD thesis.

PhD Course List

A) Each year the PhD programme in Structural, Seismic and Geotechnical Engineering offers several **Characterising Courses**. The list of the courses for the Academic Year 2017 – 2018 is reported in Table A. This list may change during the year and additional courses may be attended by the students of the 33rd cycle during the following Academic Year.

B) Every year the PhD School organizes **General and Interdoctoral courses**. The acquisition of at least **10 credits** is **mandatory** among the courses of B type.

The list of PhD courses organized by the PhD School is available at the website: <http://www.dottorato.polimi.it/en/during-your-phd/phd-school-courses>.

C) Other PhD courses

In addition and/or in alternative to those listed in Table A, students may attend PhD courses offered by other PhD programmes of Politecnico and/or by external institutions, such as CISM (www.cism.it) or Rose School (www.roseschool.it). In this case, the prior approval of both the tutor and the Coordinator is mandatory.

Minimum requirements

- 1) The minimum number of credits to be acquired from PhD course categories A) and C) is **15**.
- 2) The minimum number of credits to be acquired from PhD course category B) is **10**.
- 3) The minimum number of credits to be acquired in the first year is **15**.

PREPARATORY COURSES (only if foreseen)

If the supervisor and the tutor find it useful or necessary that the candidate attends preparatory courses (chosen for example among those activated at Politecnico di Milano), the Board of Professors of the PhD programme may assign some extra-credits to be acquired to complete the training path. Credits of this kind will be considered as additional to the minimum requirements reported above.

SPECIALISTIC COURSES, LONG-TRAINING SEMINARS

Attending special courses, workshops, schools and seminars is strongly encouraged. In case they are certified and evaluated, attendance may allow students to obtain credits, as established by the Board of Professors and with prior approval of the study plan. Courses and workshops can be added to the study plan as optional “extra teaching activities”, even if they are not evaluated and therefore cannot be qualified as credits.

To guarantee a sufficiently broad overview of the scientific activities and results in the research areas of interest to the PhD programme, **every year candidates are required to attend the seminars organized by the Department**. 70% of the seminars suggested to the PhD candidates or alternatively a minimum of 12 seminars per year must be attended.

The course planning for the academic year 2017 – 2018 follows. Other courses may be activated during the year. Candidates will be informed promptly, so that they can update their study plan accordingly.

Table A: PHD CHARACTERISING COURSES ACTIVATED IN THE A.Y. 2017 – 2018

SSD	Course name	Professor(s)	A.Y./Semester	Language	Credits
ICAR/08	Non-linear Solid Mechanics	Anna Pandolfi	A.Y. 2017-2018; 1 st semester	English	5
ICAR/08	Advanced Structural Dynamics	Federico Perotti; Vitomir Racic; Luca Martinelli	A.Y. 2017-2018; 1 st semester	English	5
ICAR/09	Fiber reinforced concrete (FRC): material characterization and structural design	Marco di Prisco	A.Y. 2017-2018 (Summer School July 2018)	English	5

6.4 Presentation of the study plan

PhD candidates must submit their study plan, which can be revised approximately every three months, in order to add new courses or to mirror the latest development of their career. Study plans must be approved by the PhD programme Coordinator in the way established by the Board of Professors of the PhD programme.

6.5 Yearly evaluations

Candidates show their work to the Board of Professors at least once a year. Admission to the following PhD year is subject to the positive evaluation of the Board of Professors (the following grades are awarded: A/B/C/D). Candidates who do not pass the exam are qualified as “Repeating candidate”(Er) or “not able to carry on with the PhD” (Ei).

Following the third year evaluation, candidates are admitted to the final PhD defense. If they have

achieved sufficient results but need more time to draw up the thesis, candidates can be given an extension of up to 12 months.

Candidates will have guidelines to prepare their presentations for the yearly evaluations and the admission to the final exam.

6.6 PhD thesis preparation

The main goal of the PhD career is the development of an original research contribution, coherent with the research issues tackled in the Department where the PhD programme is developed, so that the PhD thesis may increase knowledge in the specific research field. Consequently, candidates should stress the originality of their work and highlight its role for the improvement of the state-of-the-art.

The PhD research is developed under the guidance of a supervisor, who helps the candidate master the state-of-art, focus on the original contributions, make connections with other research groups and organize everyday research activities.

Internships or study periods in either Italian or international companies or external institutions, can complete the candidate's preparation.

The PhD study and research work is carried out **full time** during the three-year PhD programme.

At the conclusion of the PhD studies, candidates are judged by the Board of Professors: those who receive a positive evaluation will submit their thesis to two external reviewers for refereeing. If the reviewers' evaluation is positive, candidates sit the final exam in front of a Committee composed by three members. At least two of them must be external experts. Reviewers might require additional revision: if this is the case, the candidate's thesis will be subject to further evaluation after the work has been amended.

7. Laboratories, PhD Secretary Services

7.1 Experimental facilities

Advanced experimental research activities related to structures, materials and geotechnics are mostly supported by the Testing Lab for Materials, Buildings and Civil Structures (see website: <http://www.lpm.polimi.it/>), which is an officially accredited Lab to test structures and structural elements with forces ranging from 0.01 to 5000 kN, as well as to carry out physical/mechanical tests on structural and geomaterials, both in standard and high-temperature conditions. Experimental facilities are also available on the Lecco campus, and they are mainly devoted to the investigation of impact loads and advanced cementitious composites.

PhD students are strongly encouraged to perform experimental activities: the visits at the lab and the scheduled courses on Experimental Structural Mechanics serve this purpose.

7.2 Computational resources

PhD students have a personal computer for their own use.

For high-performance computing applications, two clusters for parallel computing are currently available at the Department. It is also worth mentioning that Politecnico di Milano is partner of the

consortium CINECA (www.cineca.it), which hosts FERMI, ranked 9th among the most powerful supercomputers in the world.

7.3 PhD Student Secretary Service

Federica Aggio

Department of Civil and Environmental Engineering

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8. Internationalisation and inter-sectoriality

Carrying out study and research activities at external laboratories is strongly recommended.

Politecnico di Milano supports joint PhD paths with international Institutions, as well as Joint and Double PhD programmes. Further information are available on the PhD School website and on the PhD programme website.

More specifically, the PhD programme in Structural, Seismic and Geotechnical Engineering collaborates with the following institutions:

Joint Research Center, Ispra – Italy

The PhD programme in Structural, Seismic and Geotechnical Engineering works together with the Ispra Joint Research Centre and, in particular, with the ELSA Lab (European Laboratory for Structural Assessment). Several PhD students have taken part to experimental activities within international research projects for thesis-related purposes.

IPPT – Polish Science Academy – Poland

The PhD programme in Structural, Seismic and Geotechnical Engineering collaborates with the PhD programme Mechanics of Advanced Materials, IPPT, and is partner of the European PhD programme Knowledge-Based Multifunctional Materials (KMM EDP) together with IPPT and Technische Universität Vienna. In addition, in 2013 Prof. Christian Hellmich (TUV) took part to the PhD intersectorial course ‘Non Linear Computational Mechanics for Tissues and Biomaterials’.

Universitat Politecnica de Catalunya, Barcelona – Spain

Numerous joint research activities together with the UPC have been successfully carried out in the past years, especially in the geotechnical sector.

Exchanges of PhD students and researchers have contributed to foster both PhD and research activities.

Université Joseph Fourier (UJF), Grenoble – France

The collaboration between this university and the PhD programme in Structural, Seismic and Geotechnical Engineering started several years ago and has led to a rising number of visits, exchanges and collaborations on joint research projects. Remarkable is the relation with the Institut des Sciences

de la Terre and the Laboratoire 3SR Sols, Solides et Structures, Risques.

Delft University of Technology – The Netherlands

The collaboration with the Delft University of Technology focuses on computational mechanics and the physic, numerical and theoretical modelling on the behaviour of porous materials.

A member of PhD Faculty Board has almost completed her sabbatical in Delft, where she has worked on the generation of fractures in porous materials, their hydro-mechanical characterization and flooding risks.

Ecole Centrale de Paris, Paris – France

The PhD programme in Structural, Seismic and Geotechnical Engineering boasts a long-standing collaboration with the Ecole Centrale de Paris (especially with the Laboratoire MSSMat-Mécanique des Sols, Structures et Matériaux). This has brought to the establishment of a PhD co-tutelle (jointly supervised PhD), started in 2014 and currently in its final year, as well as to joint seminars and research visits.

Interaction with and exposure to the non-academic sector is beneficial for doctoral candidates as well as for research and innovation-intensive employment sectors. Involvement in the challenges and opportunities of the non-academic sector of the economy and society is fostered by networking, connectivity, inter-sectorial mobility and wide access to knowledge.

In particular, the PhD programme in Structural, Seismic and Geotechnical Engineering collaborates with the following research agencies and industrial partners: STMicroelectronics; Tetra Pak Packaging Solutions; Italcementi; Lombardi Italia; Arup.

* **STMicroelectronics**, which is currently financing a topic scholarship within the PhD programme, is a joint Italian-French multinational company with more than 50.000 employees. Since 2000 STMicroelectronics Italia has been researching and implementing the industrial production of Micro Electro Mechanical Systems (MEMS), thanks to its strong focus on R&D.

The collaboration with STMicroelectronics Italia mainly focuses on the following themes: MEMS mechanical reliability; mechanical characterization on the micro-scale; study and modeling of accidental impact; study of dissipative phenomena; study of stiction-related problems; study and planning of resonant machines and magnetometers; study of energy harvester systems; study of innovative micro-systems for the measurement of angular velocity (micro-gyroscopes); piezoelectric MEMS.

***Tetra Pak Packaging Solutions** is part of the Tetra Laval Group, founded in 1951 in Sweden, which provides innovative processing and packaging solutions for food.

***Italcementi**, founded in 1864 and now owned by the German HeidelbergCement, is the number 1 in aggregates production, the number 2 in cement and number 3 in ready-mixed concrete worldwide.

***Lombardi Italia**, founded in 1955 as consulting company for engineering services, cares for the life

cycle of transport infrastructures and hydraulic works from the initial design phases to their operation.
***Arup** is an independent firm of designers, planners, engineers, technical specialists and consultants, which has been offering multidisciplinary professional services since 1946 and is now spread all over the world.

Attachment A1 – PhD programme Coordinator

PROF. ROBERTO PAOLUCCI

University education

- 1989 M.Sc. cum laude in Civil Engineering for Soil Protection and Land Management at Politecnico di Milano
- 1995 Ph.D. in Seismic Engineering at Politecnico di Milano

Teaching activities

- 1995-2001: researcher in the field of Structural Engineering at the Department of Civil Engineering, Politecnico di Milano.
- 2002-2010: Associate Professor in the scientific field of Structural Engineering at Politecnico di Milano.
- From 2011: Full Professor in the scientific field of Structural Engineering at Politecnico di Milano.
- From November 2011: Coordinator of the Ph.D. programme in Structural, Seismic and Geotechnical Engineering, Politecnico di Milano.

Research activities

- Analytical and numerical methods for the study of seismic wave propagation
- Dynamic soil-structure interaction
- Seismic hazard studies
- Soil vibrations caused by railway traffic

International awards

- 2000: Shamsheer Prakash Research Award for young researchers in Earthquake Geotechnical Engineering (University of Missouri – Rolla).
- 2006: Outstanding Paper Award, for the paper "Displacement Spectra for Long Periods", Earthquake Engineering Research Institute, Oakland, California

Coordination of research projects

National Coordinator

- 2008-10: National Coordinator of the project "S4 – Banca dati accelerometrica italiana" (*Italian accelerometer database*). Agreement DPC-INGV 2007-09 between the Civil Protection Department and the National Institute of Geophysics and Volcanology.
- From 2014: National Coordinator of the project "RS2 - Simulazioni di Terremoti ed Effetti Near-Source" (*Earthquake and Near-source effect simulation*), Special project ReLUIS 2014-2018

Local Coordinator

- 2003-2006: Local Coordinator of the bilater agreement between Politecnico di Milano and Public

Works Research Institute, Tsukuba, Japan, on “Seismic design of bridge foundations”, partly funded by the Italian and Japanese Ministry of Foreign Affairs.

- 2003-2005: Local Coordinator of the research project “Metodi innovativi per lo studio dell’amplificazione del moto sismico dovuta a configurazioni geologiche complesse” (*Innovative methods for the study of seismic movement amplification due to complex soil structures*), in collaboration with Politecnico di Milano and National University of Mexico City, partly funded by the Italian and Mexican Ministry of Foreign Affairs.

- 2009-2010: Local Coordinator of the research project “Interazione dinamica suolo struttura per problemi di grandi dimensioni: vibrazioni indotte in un edificio dal passaggio di un treno o di una metropolitana” (*Dynamic soil-structure interaction for large dimension-related problems: induced vibrations in a building by the transit of train or subway*), in collaboration with Politecnico di Milano and TUM, funded by the Vigoni programme (Italian-German University).

- 2012-2013: Scientific Coordinator of research unit within the programme “SIGMA - Reducing uncertainties in the probabilistic seismic hazard analysis for critical facilities”. International research programme funded by ENEL and major companies operating in the French nuclear sector (Electricité de France, Comité pour l’Energie Atomique, AREVA).

- 2012-2013: Scientific Coordinator of the research contract on “High-performance computing tools to produce physics-based earthquake ground shaking scenarios in large urban areas”, funded by MunichRe.

- 2013-2014: Scientific Coordinator of the research contract on the creation of “Linee guida per la progettazione sismica di un gasdotto in Italia Centrale” (*Guidelines for the seismic planning of a gas pipeline in central Italy*), funded by SNAM Rete Gas.

- 2015-2016: Scientific Coordinator of the research project “High-performance computing tools to produce physics-based earthquake ground shaking scenarios in large urban areas”, renewed by MunichRe.

Participation to research projects as Research Unit Responsible

- 2003-2006: Research Unit Responsible in the research project “SISMOVALP – Seismic Risk in Alpine Valleys”. EU programme INTERREG IIIB – Alpine region.

- 2001-2002: Research Unit Responsible in the research project “Modelli non-lineari per l’analisi dinamica di edifici monumentali in muratura” (*Non-linear models for the dynamic analysis of historic masonry buildings*). Scientific research project funded by the Italian Ministry of Education, University and Research (PRIN), 2001 call for selection.

- 2005-2007: Research Unit Responsible in the research project “S5, Definizione dell’input sismico sulla base degli spostamenti attesi” (*S5, Definition of the seismic input on the basis of the expected motions*). Convention DPC-INGV 2005-07 between the Civil Protection Department and the National Institute of Geophysics and Volcanology

- 2005-2008: Research Unit Responsible in the research project “Sviluppo di approcci agli spostamenti per il progetto e la valutazione della vulnerabilità – Fondazioni superficiali e profonde” (*Development*

of motion approaches for vulnerability planning and assessment – Superficial and deep foundations) (RELUIS Theme 4). Convention DPC-RELUIS 2005-08 between the Civil Protection Department and the Seismic Engineering University Labs network

- 2006-2007: Research Unit Responsible in the research project “Limiti di applicabilità dei metodi pseudo-statici nelle analisi di stabilità dei pendii e delle opere di sostegno dei terreni in zona sismica” (*Limits of application of pseudostatic methods for the structural stability assessment of slopes and soil support structures in seismic areas*). Scientific research project funded by the Italian Ministry of Education, University and Research (PRIN), 2005 call for selection.

- 2010-2013: Research Unit Responsible in the research project “Sviluppo di approcci agli spostamenti per la valutazione della vulnerabilità – Fondazioni superficiali e profonde” (*Development of motion approaches for vulnerability planning and assessment – Superficial and deep foundations*) - (RELUIS Theme 2). Convention DPC-RELUIS 2009-12 between the Civil Protection Department and the Seismic Engineering University Labs network

Prof. Paolucci also took part to several other research projects, 7 of which funded directly by the European Commission.

Keynote and invited lectures (past 5 years)

– “3D Numerical Simulations of Earthquake Ground Motion in Sedimentary Basins”, at the 4th International Symposium IASPEI / IAEE on the “Effects of Surface Geology on Seismic Motion”, University of California Santa Barbara, August 2011.

– “The role of non-linear dynamic soil-foundation interaction on the seismic response of structures”, at the 2nd Int. Conf. on Performance-Based Design in Geotechnical Earthquake Engineering, Taormina, May 2012.

– “The importance of strong-motion data in engineering seismology and earthquake engineering”, at the Int. Workshop “ORFEUS - Seismic Networks and Acceleration Networks”, Istanbul, November 2012.

– “Engineering seismology aspects of the Mw6 seismic sequence in Emilia-Romagna, May-June 2012”, at the opening ceremony of the SEISM Institute “Seismology and Earthquake engineering for Risk Assessment”, Comité pour l’Energie Atomique (CEA), Paris-Saclay, December 2012.

– “Introducing Dynamic Nonlinear Soil-Foundation-Structure Interaction Effects in Displacement-Based Seismic Design”, at the Int. Workshop “Design, Analysis and research related to highly non-linear soil-structure interaction”, Oakland, June 2013.

– “High-Performance 3D Numerical Simulations for Seismic Scenarios: an Engineering Perspective”, at the SIAM Conference on Mathematical and Computational Issues in the Geosciences. Padova, June 2013.

– “Physics-based earthquake ground shaking scenarios in large urban areas”, at the 2nd European Conference on Earthquake Engineering and Seismology, Istanbul, August 2014.

– “The 3D Numerical Simulation of Near-Source Ground Motion during the Marsica Earthquake, Central Italy, 100 years later”, at the 6th Int. Conference on Earthquake Geotechnical Engineering, Christchurch,

November 2015.

Participation to scientific and technical international committees

- Member of the Project Team SC8.T1 in charge of the revision of the Part 1 of the Eurocode 8 EN1998-1 (Sections 1-4, 10).
- Member of the international scientific committee of the SEISM Paris Saclay Institute (CEA, CNRS, EDF, ENS Cachan, Ecole Centrale Paris).
- Member of the scientific committee of the Eucentre Fundation, Pavia.
- Member of the technical committee TC203 “Geotechnical Earthquake Engineering and Associated Problems”, International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE).
- Member of the Working Group 1 “Future directions for Eurocode 8”, European Association for Earthquake Engineering (EAEE).
- Member of the Editorial Board of the journals "Earthquake Engineering and Structural Dynamics" and "Bulletin of Earthquake Engineering".

Publications

Prof. Paolucci has authored about 130 scientific contributions, most of them published in international journals.

Attachment A2 – PhD Board of Professors

The PhD programme in Structural, Seismic and Geotechnical Engineering boasts a Board of Professors consisting of faculties belonging to the Department of Civil and Environmental Engineering, thus ensuring a continuous assistance and supervision to the PhD students.

Name	Affiliation	SSD / Title of SSD
Roberto Paolucci (Coordinator)	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Ardito Raffaele	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Bamonte Patrick	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Biondini Fabio	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Bolzon Gabriella	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Bruggi Matteo	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Comi Claudia (Vice-Coordinator)	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Corigliano Alberto	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Coronelli Dario	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Della Vecchia Gabriele	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/07 – Geotechnics
Di Prisco Claudio	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/07 – Geotechnics
Di Prisco Marco	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Fedele Roberto	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Felicetti Roberto	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Ferrara Liberato	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Frangi Attilio Alberto	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Ghisi Aldo	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Jommi Cristina	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/07 – Geotechnics

Lualdi Maurizio	Politecnico di Milano - Department of Civil and Environmental Engineering	GEO/11 – Applied Geophysics
Malerba Pier Giorgio	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering
Mariani Stefano	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Martinelli Luca	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Perego Umberto	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Petrini Lorenza Maria	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/08 – Structural Mechanics
Rosati Gianpaolo	Politecnico di Milano - Department of Civil and Environmental Engineering	ICAR/09 - Structural Engineering

Attachment A3 – PhD Advisory Board

The PhD Advisory Board is composed by managers and high-level self-employed people working in companies where research and development play a role of leading importance. Their knowledge of the market trends, their advices and their experience are of great help when outlining new educational paths within the PhD programme.

Name	Affiliation
Albert Luigi	Soil Geotecnica, Milano
Beltrami Carlo	Lombardi Ingegneria, Milano
Borsari Roberto	Tetra Pak. Packaging Solutions S.p.A.
Canetta Giovanni	CeAS, Milano
Cangiano Stefano	C.T.G. Italcementi, Bergamo
Gabetta Giovanna	ENI, Milano
Mazzà Guido	Enel-RSE
Negro Paolo	JRC, Ispra
Scuri Silvia	Artech srl, Milano
Teora Maurizio	Arup Italia
Zambon Massimo	Techint, Milano