



POLITECNICO
MILANO 1863

**Ph.D. School - Politecnico di Milano Regulations of
the Ph.D. Programme in:**

MATERIALS ENGINEERING

Cycle XLI

1. General Information

Ph.D. School - Politecnico di Milano

Ph.D. Programme: Materials Engineering

Course start: September 2025

Location of the Ph.D. Programme: Milano Leonardo

Promoter Department: Dipartimento di Chimica, Materiali e Ingegneria Chimica "Giulio Natta"

Scientific Disciplinary Sectors (2024)

- IMAT-01/A (09/IMAT-01): Scienza e Tecnologia dei Materiali ("Materials Science and Technology")
- IIND-03/C (09/IIND-03): Metallurgia ("Metallurgy")
- ICHI-01/A (09/ICHI-01): Chimica Fisica Applicata ("Applied Physical Chemistry")
- PHYS-03/A (02/PHYS-03) Fisica della Materia ("Physics of matter")
- CHEM-06/A (03/CHEM-06): Fondamenti Chimici delle Tecnologie ("Chemical Foundations of Technologies")
- IBIO-01/A (09/IBIO-01): Bioingegneria Industriale ("Industrial Bioengineering")

Ph.D. School Website: <https://www.dottorato.polimi.it/>

Ph.D. Programme Website:

<https://www.dottorato.polimi.it/corsi-di-dottorato/ingegneria/ingegneria-dei-materiali>

2. General presentation

The Ph.D. Programme in Materials Engineering offers excellent educational opportunities for young talents and professionals aiming to become proactive experts and researchers skilled in the design, production and application of both traditional and innovative material. The programme covers material optimization for specific applications, performance prediction and assessment, and the development of new concepts and technologies across materials-related fields.

Key features of the Ph.D. Programme in Materials Engineering include:

- ▶ A rigorous scientific approach to address cutting-edge research.
- ▶ An effective interdisciplinary approach.
- ▶ Strong connections with leading international scientific and technical communities.
- ▶ A close integration with the Doctoral School of Politecnico di Milano, enhancing knowledge through transversal courses, soft skill development, and participation in stimulating activities.

Materials Engineering involves investigating the correlation between materials structure, processing, and functional/structural properties, as well as managing knowledge from material design to final application.

The training comprises a three-year programme that requires the completion of 180 credits, 25 of which are earned through attending Ph.D. level courses. These courses provide both a solid foundational background and specialized qualifications.

The Programme includes advanced research and training on:

- ▶ Research and development of traditional materials (polymers, metals, ceramics, concrete, composites) and related technologies.
- ▶ Specific application areas: materials for energy, materials for environment, materials for electronics, optoelectronics and photonics, materials for cultural heritage, materials for product design, materials for packaging, biomaterials.
- ▶ Smart, responsive, and self-healing materials, as well as nanostructured materials.
- ▶ Materials corrosion and durability, life cycle assessment, and surface functionalization.

The Ph.D. Programme is run by a Coordinator and a Faculty Board. The Coordinator (see Attachment A1) chairs the Faculty Board, coordinates the preparation of the annual Educational Programme and organises the general educational activities of the Ph.D. courses.

The Faculty Board is responsible for the Educational programme, for supervision of the Ph.D. students research, and for teaching and related administrative activities (see Attachment A2).

Ph.D. Course in Materials Engineering received the appraisal of “Innovative Ph.D. Course” by the Italian Ministry of Education, Universities and Research.

3. Objectives

The objective of the Ph.D. Course in Materials Engineering is to educate proactive professionals who deeply understand the correlation between material structure at various length scales, the effects of processing on structure, and the final properties in use. This knowledge equips graduates with the skills needed for the design, production, and application of both traditional and innovative materials, including their optimization for specific applications, as well as the prediction and assessment of their performance and durability. As outlined in the general presentation, these skills can be developed across various materials-related fields, all of which require a common multidisciplinary approach.

One of the key skills developed during the PhD experience is the ability to transfer knowledge effectively, adapting it to different contexts, audiences, and communication settings. This ability allows PhD graduates to collaborate efficiently in teams and to disseminate their research findings both within their academic community and to broader, more diverse audiences.

The PhD program aims to equip candidates with the ability to communicate technical information effectively, both orally and in writing, and to tailor their communication to academic and non-academic audiences. This goal is supported by courses offered by the PhD School, including classes in Technical Communication. In addition, candidates engage in activities that promote experiential learning ('learning by doing'), which is a hallmark of the PhD experience.

Each candidate will experience three modes of technical-scientific communication:

1. Oral presentation to experts in the field, designed to develop the ability to communicate advanced content clearly and concisely, emphasizing key aspects of the research and justifying methodological choices. This experience, which fosters peer-to-peer project sharing, is gained by presenting at least once at a conference, workshop or team meeting.
2. Presentation to stakeholders with field expertise but not in the specific topic, focusing on effectively conveying content with appropriate detail and without strict time limits. This skill—essential for communicating research to non-expert collaborators—is developed through targeted training aligned with the goals and timelines typical of academic and corporate environments.
3. Written communication for an expert community, focusing on organizing content that is more concise than a book or thesis but still comprehensive, with appropriate technical-scientific detail. This skill, typical of internal reports or technical notes, is developed through creating written documents for relevant scientific communities, such as scientific or technical articles.

Each candidate is expected to: (i) participate in at least one national or international conference or workshop with either an oral presentation or a poster contribution, and (ii) publish at least one scientific or technical paper aimed at an expert audience. Any exceptions must be justified and approved by the Faculty Board.

4. Professional opportunities and job market

The Ph.D. Programme in Materials Engineering aims to train Ph.D. graduates with a strong foundational background and specialized qualifications in advanced research areas. The knowledge and skills acquired through this programme enable graduates to pursue careers in the manufacturing industry, which seeks innovation in the production, processing, application, and conservation of traditional materials, as well as the development of innovative materials that open the door to radically new and currently unforeseeable applications.

Furthermore, the experience gained from full-time involvement in both research and education also prepares Ph.D. graduates for academic careers. Many former graduates of the Materials Engineering Programme have secured post-doctoral research positions at prestigious universities and research institutes.

5. Enrolment

5.1 Admission requirements

Italian and foreign citizens can apply. They are requested to have graduated in accordance with the pre-existing laws D.M. 3.11.1999 n. 509, or to have a Master of Science degree in accordance with D.M. 3.11.1999 n. 509, or a Master of Science in accordance with D.M. 22.10.2004 n. 270, or similar academic title obtained abroad, equivalent for duration and content to the Italian title, with an overall duration of university studies of at least five years.

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

The admission to the Programmes will be established according to the evaluation of the candidates curricula and an illustrative report about the development of a possible Ph.D. research, which candidates will send contextually with their application to the admission announcement.

Foreign candidates will be asked to demonstrate knowledge of the Italian language, equal to at least A1 level of the Common European Framework of Reference for the knowledge of languages. This requirement will be needed in order to register for the final exam. Italian native speakers and all those who can demonstrate knowledge of the Italian language to the required level will be exempt.

Further details on the admission requirements are included in the Ph.D. Regulation of Politecnico di Milano and Italian decrees (Link to those documents: <https://www.dottorato.polimi.it/en/prospective-phd-candidates/calls-and-regulations/regulations>)

5.2 Admission deadlines and number of vacancies

The number of positions is indicated in the Call for admission to the 41th Ph.D. cycle Programmes: <https://www.dottorato.polimi.it/>

Scholarships both on Open subjects and on specific themes are available, according to the Call for admission.

6. Contents

6.1 Requirements for the Ph.D. title achievement

The achievement of the Ph.D. title in Materials Engineering requires a full-time study and research activity of at least three years which is completed by the development and defense of the Ph.D. thesis.

The research conducted by the Ph.D. candidate is supervised by an academic or a field expert, while encouraging proactivity and independence.

Ph.D. candidates in Materials Engineering must earn at least 25 course credits (see section 6.3 below) while continuously conducting research.

At the start of their studies, each Ph.D. candidate is assigned a tutor by the Faculty Board. The tutor, who is a member of the Faculty Board, provides guidance and support throughout the candidate's training program. Tutors assist candidates in selecting courses for their study plan, which is then submitted for approval by the Coordinator of the Ph.D. Programme (see also section 6.4 below).

The Faculty Board may assign additional course credits if candidates need to complete their preparation in specific topics relevant to their research projects.

Candidates must demonstrate proficiency in the Italian language at least at the A1 level of the Common European Framework of Reference for Languages. This requirement must be met in order to register for the final exam. Native Italian speakers and those who can demonstrate proficiency at the required level will be exempt.

6.2 Research development

The primary goal of all Ph.D. programmes at Politecnico di Milano is to cultivate a research-oriented mindset in candidates, with expertise and skills in a specific research area. To achieve this, candidates develop problem-solving abilities in complex contexts, including the capacity to conduct in-depth problem analysis, identify innovative solutions, and assess their applicability in practical settings.

These skills offer Ph.D. candidates significant opportunities to develop and lead future research in both academia and public or private organizations.

Ph.D. candidates are expected to contribute original research through publications and their Ph.D. thesis, which must advance knowledge in their research field. Additionally, the thesis should align with the research topics developed within the Department where the Ph.D. programme is hosted.

Specifically, the Ph.D. thesis compiles the candidate's original research findings, positioned within the context of the current state of the art in the specific research field.

Ph.D. research is developed under the guidance of a supervisor, who assists the candidate in planning the research and in the daily activities related to the thesis development. The supervisor is not necessarily a member of the Faculty Board and may come from an institution outside Politecnico di Milano. The supervisor may be supported by one or more co-supervisors.

Further activities aimed at enhancing the candidate's personal skills and research expertise are encouraged throughout the Ph.D. programme.

Candidates are expected to develop the ability to present and discuss their research within their academic community. Therefore, participation in international conferences and publication of research findings in peer-reviewed journals are strongly encouraged.

The Ph.D. Programme also supports research interactions with other groups in the candidate's field, preferably abroad. Research visits lasting at least three months are strongly encouraged, as they offer candidates additional skills and insights that can enhance their research work and thesis.

The duration of the Ph.D. programme is typically three years, while the Executive Ph.D. programme generally lasts four years.

6.3 Objectives and general framework of the teaching activities

The Ph.D. Programmes and the Ph.D. School activate different teaching proposals, including courses, seminars, project workshops, laboratories. Teaching activities cover both basic research issues (problems, theories, methods), at the foundation of the Ph.D. Programme and its cultural context, and specialistic topics related to the subjects developed in the theses.

Lessons are usually held in English, except when otherwise stated. The Ph.D. Programme includes at least one complete study plan delivered in English language.

Structured teaching activities allow to earn ECTS credits. Other educational activities, for which an assessment process is difficult to implement do not allow to earn ECTS. However, they are reported and taken into account by the Faculty Board in the annual evaluation of the scientific and educational activities.

The Ph.D. School of Politecnico di Milano offers a set of courses aiming at training the Ph.D. candidates in soft and transferable skills. The skills and abilities provided by these courses are expected to help candidates across different areas of their careers making them able to react to the rapidly evolving needs of the global economy and society at large. The Ph.D. School courses activated for the 2025-2026 Academic Year are summarized in the following table:

Table: Ph.D. School courses list. The list may be modified after the publication of the present document

Professor	Course	Credits
Armondi Simonetta	Strengthening Critical Spatial Thinking	5
Arnaboldi Michela	Advanced Interaction Skills For Academic Professionals	5
Biscari Paolo	Industrial Skills	5
Biscari Paolo	English For Academic Communication	5
Biscari Paolo	Scientific Communication In English	5
Biscari Paolo	Research Skills	5
Boeri Elisa	Recording Work 4 Building Memory: Methods, Practices, Tools, Skills To Manage The Knowledge	5
Brunetto Domenico Savio	Innovative Teaching Skills	5
Canina Maria Rita	Creative Design Thinking	5
Colombo Gabriele	Research Communication. Issue Mapping: Exploring Public Debates Surrounding Academic Topics	5
Conci Claudio	Communication Strategies That Score In Worldwide Academia	5
Di Blas Nicoletta	Professional Communication	5
Fuggetta Alfonso	Project Management Basics	5
Iarossi Maria Pompeiana	Power Of Images And Visual Communication For Research Dissemination	5
Jacchetti Emanuela	Scientific/Academic English: writing and presenting with and without the support of LLMS	5
Lavagna Monica	Sustainability Metrics, Life Cycle Assessment And Environmental Footprint	5
Mancini Mauro	Project Management (In Action)	5
Masarati Pierangelo	Ethical Aspects Of Research On Dual Use Technologies	5
Oppio Alessandra	How To Support Complex Decisions: Approaches And Tools	5
Ossi Paolo Maria	Sulla Responsabilità Della Tecnica	5
Oxoli Daniele	The Copernicus Green Revolution For Sustainable Development	5
Paganoni Anna Maria	La Comunicazione Nella Scienza	5
Pizzocaro Silvia Luisa	Practicing Research Collaboration	5
Raos Guido	Science, Technology, Society and Wikipedia	5
Rocchi Daniele	Ethics Of Artificial Intelligence	5
Sancassani Susanna	Teaching Methodologies, Strategies And Styles	5
Schiaffonati Viola	Digital Humanism	5
Shendrikova Diana	Science Diplomacy For Researchers. Filling The Gap Between Science And Policy Within The Global Challenges	5
Volonté Paolo Gaetano	Introduction To Academic Research	5

Ten of the 25 course ECTS credits required for each candidate must be earned through soft and transferable skills courses organized by the Ph.D. School.

Each year the Ph.D. Programme in Materials Engineering offers Ph.D. level courses for at least 20 credits. A

summary of these courses is provided in the following tables. For all courses, attendance is mandatory, and a final examination is required. Evaluation may be based on a written exam, a written report, an oral exam, or a seminar on a specific topic, followed by a final discussion. The evaluation method for each course is outlined in the individual course syllabus, as specified by the professor in charge.

Course syllabi and schedules are available on the Ph.D. Programme in Materials Engineering website. Course descriptions are also reported in the Study Programme (“Manifesto”) of the Ph.D. in Materials Engineering.

The table below summarizes the guidelines for presenting the candidate's study plan. In parallel, candidates will be continuously involved in their research activity under the guidance of their supervisor.

Courses	Possible details or reference to following tables	Number of credits
Courses characterizing the Ph.D. Programme in Materials Engineering	See Table A	15 minimum
Ph.D. School Courses	See Table B	10 minimum

The course activities of the Ph.D. candidate are expected to be concentrated in the first two years of the programme. To be admitted to the second year, the Ph.D. student must have earned at least 10 credits by attending courses and passing the relevant examinations. Similarly, the student must have earned at least 20 of the 25 required credits before starting the third year. Only a maximum of 5 credits may be earned during the third year (or possibly during the fourth year, in case of an extension, see section 6.5).

Ph.D. Course List

Type A COURSES

The Ph.D. Programme in Materials Engineering offers Characterizing Courses listed in Table A. To be admitted to the final exam, candidates must earn at least 15 ECTS credits from this list. The substitution of up to 5 of these credits with an equivalent number from other courses—such as courses from other Ph.D. programmes or summer schools of comparable duration to Type A courses, and with final evaluation—must be approved by the Faculty Board of the Ph.D. Programme in Materials Engineering prior to attending the course.

The list of Ph.D. courses organized by the Ph.D. Programme in Materials Engineering is available at the website:

<https://www.dottorato.polimi.it/corsi-di-dottorato/ingegneria/ingegneria-dei-materiali>

Type B COURSES

The Ph.D. School offers every year general and Interdoctoral courses. The acquisition of 10 credits is mandatory among the courses of B type. The list of Ph.D. courses organized by the Ph.D. School is available at the website <https://www.dottorato.polimi.it/en/phd-school/phd-level-courses>

PREPARATORY COURSES

If the supervisor and the tutor find useful or necessary that the candidate attends preparatory courses (chosen among the activated courses at the Politecnico di Milano), the Faculty Board of the Ph.D. Programme may assign some extra-credits to be acquired to complete the training. The Faculty Board will decide in advance if credits acquired in this way will concur to the mandatory 25 ECTS credits or will constitute an additional requirement.

SPECIALISTIC COURSES, LONG-TRAINING SEMINARS, SUMMER SCHOOLS

Attendance at Specialist Courses, Workshops, Schools, and Seminar cycles is strongly encouraged. If these activities are comparable in duration to Type A courses and provide a final exam certification, they may substitute up to 5 ECTS credits of Type A courses, but only with explicit approval from the Faculty Board prior to participation. These courses and workshops can be added to the study plan as optional "additional learning activities," even if they are not evaluated (and thus not eligible for credit).

The scheduled course planning for the academic year 2025-2026 follows. Other courses may be activated during the year. In this case, the candidates will be promptly informed and will be allowed to insert these new courses in their study plan. All the PhD courses are held in English.

Table A: PH.D. COURSES CHARACTERISING THE PH.D. PROGRAMME

Course Title	Professor	Credits
Perspectives On Material Investigation Techniques	Tommasini, Fiorati	5
Material characterization (with laboratories) – Module 1(*): SEM, EDS, SRD, GDOES, Optical Microscopy, Laser Profilometry	Del Zoppo Macchi	5
Material characterization (with laboratories) – Module 2(*): NMR, FT-IR, RAMAN, DSC, DTA, TGA, AFM, STM	Castiglione, Derudi, Lucotti, Casari	5
Material characterization (with laboratories) – Module 3(*): Method for the physico mechanical characterization (Contact angle determination, Indentation, Scratch, Dynamic Mechanical Analysis, Shear/Extensional Rheometry)	Briatico, Gastaldi, Andena, Griffini	5
Synchrotron X-ray diffraction spectroscopy and imaging (SUMMER SCHOOL – Erogato dal Dottorato di Fisica)	Moretti, Macchi	
Experimental methods in electrochemistry and corrosion	Vicenzo, Brenna	5
Python driving license	Raos, Bruschi, Miglio	5

(*) only one out of these three Courses can be inserted in the study plan

TABLE B: SUGGESTED CROSS –SECTORAL COURSES -.

The list may be modified after the publication of the present document

Professor	Course	Credits
Armondi Simonetta	Strengthening Critical Spatial Thinking	5
Arnaboldi Michela	Advanced Interaction Skills For Academic Professionals	5
Biscari Paolo	Industrial Skills	5
Biscari Paolo	English For Academic Communication	5
Biscari Paolo	Scientific Communication In English	5
Biscari Paolo	Research Skills	5
Boeri Elisa	Recording Work 4 Building Memory: Methods, Practices, Tools, Skills To Manage The Knowledge	5
Brunetto Domenico Savio	Innovative Teaching Skills	5
Canina Maria Rita	Creative Design Thinking	5
Colombo Gabriele	Research Communication. Issue Mapping: Exploring Public Debates Surrounding Academic Topics	5
Conci Claudio	Communication Strategies That Score In Worldwide Academia	5
Di Blas Nicoletta	Professional Communication	5
Fuggetta Alfonso	Project Management Basics	5
Iarossi Maria Pompeiana	Power Of Images And Visual Communication For Research Dissemination	5
Jacchetti Emanuela	Scientific/Academic English: writing and presenting with and without the support of LLMS	5
Lavagna Monica	Sustainability Metrics, Life Cycle Assessment And Environmental Footprint	5
Mancini Mauro	Project Management (In Action)	5
Masarati Pierangelo	Ethical Aspects Of Research On Dual Use Technologies	5
Oppio Alessandra	How To Support Complex Decisions: Approaches And Tools	5
Ossi Paolo Maria	Sulla Responsabilità Della Tecnica	5
Oxoli Daniele	The Copernicus Green Revolution For Sustainable Development	5
Paganoni Anna Maria	La Comunicazione Nella Scienza	5
Pizzocaro Silvia Luisa	Practicing Research Collaboration	5
Raos Guido	Science, Technology, Society and Wikipedia	5
Rocchi Daniele	Ethics Of Artificial Intelligence	5
Sancassani Susanna	Teaching Methodologies, Strategies And Styles	5
Schiaffonati Viola	Digital Humanism	5
Shendrikova Diana	Science Diplomacy For Researchers. Filling The Gap Between Science And Policy Within The Global Challenges	5
Volonté Paolo Gaetano	Introduction To Academic Research	5

6.4 Presentation of the study plan

Ph.D. candidates must submit a study plan, which may be revised periodically (approximately every month), in order to suit possible changes in the course list or needs motivated by the development of their Ph.D. career. The study plans must be approved by the Ph.D. Programme Coordinator, according

to the guidelines stated by the Faculty Board of the Ph.D. Programme.

6.5 Yearly evaluations

Candidates present their work to the Faculty Board at least once a year. In particular, the candidates must pass an annual evaluation in order to be admitted to the following Ph.D. year.

The third-year evaluation establishes the candidate's admission to the final Ph.D. defense.

As a result of each annual evaluation, the candidates who pass the exam receive an evaluation (A/B/C/D) and may proceed with the enrolment at the following year. Candidates who do not pass the exam are qualified either as “Repeating candidate (Er) ” or “not able to carry on with the Ph.D. (Ei)”. In the former case (Er), the candidates are allowed to repeat the Ph.D. year at most once. The Ph.D. scholarships – if any – are suspended during the repetition year. In the latter case (Ei) the candidates are excluded from the Ph.D. programme and lose their scholarships – if any.

In case the Faculty Board holds appropriate to assign directly an exclusion evaluation (Ei) without a previous repetition year, the request must be properly motivated, and validated by the Ph.D. School.

After the final year, candidates who have achieved enough results but need more time to conclude their research work and write their thesis, may obtain the admission to a further year. Normally, no additional scholarship will be provided for the additional year.

6.6 Ph.D. thesis preparation

The primary objective of the Ph.D. programme is to develop an original research contribution. The Ph.D. thesis should advance knowledge in the candidate's research field.

The Ph.D. study and research work are conducted full-time over at least three years. Internships or study periods in Italian or international companies or external institutions may complement the candidate's training.

The resulting thesis must align with the research topics developed within the Department where the Ph.D. Programme is offered.

The candidate is required to present an original thesis and discuss its contribution to the state of the art in the research field within the academic community.

Ph.D. research is conducted under the guidance of a supervisor, who assists the candidate in planning their research and in the day-to-day activities related to thesis development.

At the end of the Ph.D. studies, the Faculty Board evaluates the candidate's work. Candidates who receive a positive evaluation will submit their theses to two external reviewers for assessment. If the reviewers' evaluation is positive (or after the required revisions are made), the candidate defends their thesis in a final exam before a committee of three members, at least two of whom must be external experts.

7. Laboratories, Ph.D. Secretary Services

Ph.D. candidates have access to the laboratories of research groups taking part in the Ph.D. Programme in Materials Engineering, which are located in the Department of Chemistry, Materials and Chemical Engineering “Giulio Natta” (CMIC), and in the Department of Energy (DENG). The facilities of the departmental laboratories at CMIC “Servizio di Analisi Microstrutturale dei Materiali” (SAMM), “Laboratorio Analisi Chimiche” (LAC), “Laboratorio NMR”, and “LaBS” are also available.

Ph.D. students can refer to the Secretariat of the Ph.D. Programme for any teaching or administrative issues:

Katia De Vettori - Lidia Martin – Alessia Colombi

Email: PhD-IM@polimi.it

Telephone: +39-02-2399. 4771/ 4740 / 3153

8. Internationalisation and inter-sectoriality

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

Politecnico di Milano supports joint Ph.D. paths with International Institutions, as well as Joint and Double Ph.D. programmes. Further information is available on the Ph.D. School website and on the Ph.D. programme website.

Research collaborations (Ph.D. students exchanges, research stages, visiting professors) are active with the following Universities and Research Centres:

- MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON (US)
- STANFORD UNIVERSITY, CALIFORNIA (US)
- EIDGENSSISCHE TECHNISCHE HOCHSCHULE - ETH, ZURICH (SWITZERLAND)
- CERN, GENEVE (SWITZERLAND)
- CERN, GRENOBLE (SWITZERLAND)
- UNIVERSITY OF OULU, OULU (FINLAND)
- MAX PLANCK INSTITUTE for POLYMER RESEARCH, MAINZ (GERMANY)
- LUNDS UNIVERSITET (SWEDEN)
- UNIVERSITY OF GRANADA, GRANADA (SPAIN)
- RADBOUD UNIVERSITEIT NIJMEGEN, NIJMEGEN (NETHERLAND)
- UNIVERSIDAD DEL PAIS VASCO UPV-EHU (SPAIN)
- UNIVERSITY OF ULM (GERMANY)
- UNIVERSITAT POLITECNICA DE VALENCIA (SPAIN)
- AALBORG UNIVERSITET - AALBORG UNIVERSITY (SWEDEN)
- CHALMERS UNIVERSITY OF TECHNOLOGY (SWEDEN)
- DELFT UNIVERSITY OF TECHNOLOGY (NETHERLAND)
- CATHOLIC UNIVERSITY OF LEUVEN (BELGIUM)

- CZECH TECHNICAL UNIVERSITY (CZECH REPUBLIC)
- UNIVERSITY OF CALIFORNIA (US)
- UNIVERSITE' DE GENEVE (SWITZERLAND)
- KUNGLIGA TEKNISKA HOGSKOLAN - KTH ROYAL INSTITUTE OF TECHNOLOGY (SWEDEN)
- NANYANG TECHNOLOGICAL UNIVERSITY (SINGAPORE)
- TAMPERE UNIVERSITY OF TECHNOLOGY (FINLAND)
- UNIVERSITY OF TORONTO (CANADA)
- PALACKY UNIVERSITY (CZECH REPUBLIC)
- UNIVERSITAT HAMBURG (GERMANY)
- SPANISH COUNCIL FOR SCIENTIFIC RESEARCH (SPAIN)
- LABORATORY OF THE FUTURE (FRANCE)
- UNIVERSITE DE MONTPELLIER (FRANCE)

Interaction and collaboration with non-academic institutions provide significant benefits to both doctoral candidates as well as to research and innovation intensive institutions.

In particular, the Ph.D. Programme in Materials Engineering collaborates with the following Research Agencies and/or Industrial partners.

- Unione Europea
- ABB
- Acciaierie COGNE
- Chemisol
- Eni Versalis
- Goglio
- IIT - Fondaz. Istituto Italiano di Tecnologia
- INAF Istituto Nazionale di Astrofisica
- Limenet
- Luxottica
- Mondo
- Novatex
- Pietro Fiorentini
- PPG
- Rosler
- RSE spa Ricerca Sistema Energetico
- Solvay Specialty Polymers Italy Spa
- STMicroelectronics
- Tetra Pak
- X-Nano

Attachment A1 – Ph.D. Programme Coordinator

Chiara Bertarelli received the degree in Industrial Chemistry in 1997 from the Università degli Studi di Milano (Milan, Italy). In 1998 awarded a post-laurea grant to attend the "Advanced School in Polymer Science G. Natta" at Politecnico di Milano and received the diploma with honors in 2000. She then awarded a PhD grant in Materials Engineering at Politecnico di Milano and got the diploma with honours in 2003. Visiting Professor at the Faculty of Textile Science & Technology of Shinshu University (JPN) in 2010 and at the ENS of Cachan (FR) in 2016. At present, is Full Professor in the Scientific Area of Materials Science and Technology.

Teaching Activities

She was lecturer of the courses "Organic Functional Materials", both in Italian (from 2003 to 2010) and in English (from 2005 to 2011), the course "Tecnologie dei Materiali Nanostrutturati" since 2010/2011 academic year, "Functional Materials" since 2011/2012 academic year, "Instrumental Methods for Materials Analysis" since 2020, and "Laboratorio di Sintesi Finale" since 2015. She was assistant lecturer within the course "Structure of Polymer Materials (from 2002 to 2004 and from 2006 to 2011) for students in Ingegneria dei Materiali. Moreover, she was invited to give lessons within the Doctoral Course of Electronic Engineering and post-laurea Master Courses on Materials for Cultural Heritage.

Management

She has held office in Council of the Department of Chemistry, Materials and Chemical Engineering of Politecnico di Milano from 2007 to 2010 and from January 2023 to date, in Faculty of the Doctoral Programme in Materials Engineering since 2011, and she is Coordinator of the same Doctoral Programme since the 2020. Member of the PhD School Council of Politecnico di Milano since the 2022. Member of Board of Directors of Fondazione Politecnico di Milano since 2024. Is Team Leader of the Laboratory of Design and Synthesis of Functional and Nanostructured Materials of Politecnico di Milano.

Research Activities

The present research activities deal with the design and synthesis photochromic materials for smart optical devices and biomedicine, conjugated oligomers and polymers based on thiophene derivatives for optoelectronic devices and thermoelectric generators, and the development of functional nanofibers by electrospinning. The quality of the research activity is assessed by 156 Scopus publications and three reviews. She has $h_i = 30$ and a total number of citations of 3083 (Source Scopus, March 2025). She is co-inventor of three WO patent and two Italian patent. The complete list of publications can be found at the ORCID website: <https://orcid.org/0000-0002-4577-0741>. She presented many notes at National and International Conferences and has several invited speeches.

Management of research projects

Has participated to many projects funded by the Italian Scientific and Technological Ministry (MIUR), by the Italian Foundation 'Fondazione Cariplo' and European Community. Among these, she was research line manager of the JRA6 in "Optical Infrared Coordinator Network for Astronomy (OPTICON)" FP6 (2004-2008) – In the 7th FP Framework, she is Person in charge of scientific and technical/technological aspects for Politecnico di Milano in the EU Project (OPTICON)" for 2009-2012 and for 2013-2015. In the H2020 she is Person in charge of scientific and technical/technological aspects for Politecnico di Milano in the new EU OPTICON Project. Team leader in the PRIN-MUR project "Membrane targeted light driven nanoactuators for neuro-stimulation (2022-2025). Project Coordinator of the project entitled "Orientation and segregation phenomena in electrospun hybrid polymer systems and in polymer blends" funded by INSTM (National Consortium of Materials Science and Technology) (2008- 2009). Local Coordinator of the Projects entitled "Nanostructured MATerials for Innovative Hybrid Solar cells - MATHYS" (2010-2012) and "Inkjet printing of integrated organic optoelectronic devices: from molecular design to a digital X-ray imager (InDiXi) (2012-2014) funded by Fondazione Cariplo.

Attachment A2 – Ph.D. Faculty Board

Description of the composition of the Faculty Board

Name	Affiliation	Scientific Disciplinary Sector
Bertarelli Chiara (coordinator)	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Briatico Vangosa Francesco (vice-coordinator)	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Altomare Lina	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Beghi Marco	Dipartimento di Energia	PHYS-03/A
Bolzoni Fabio	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Chiesa Roberto	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Dotelli Giovanni	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Franz Silvia	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Goidanich Sara	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Levi Marinella	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A

Li Bassi Andrea	Dipartimento di Energia	PHYS-03/A
Macchi Piero	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	CHEM-06/A
Magagnin Luca	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	ICHI-01/A
Marano Claudia	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Pedefferri Maria Pia	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Raffaini Giuseppina	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	CHEM-06/A
Raos Guido	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	CHEM-06/A
Redaelli Elena	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Tommasini Matteo	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Turri Stefano	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IMAT-01/A
Vena Pasquale	Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta	IBIO-01/A

Attachment A3 – Ph.D. Advisory Board

Description of the composition of the Advisory Board

Name	Affiliation
Bernasconi Marco	Dip. Scienza dei Materiali, Università Milano Bicocca
Ferrera Marco	ST Microelectronics
Gialanella Stefano	Dip. Ingegneria Industriale, Università di Trento
Giannini Luca	Pirelli SpA
Martucci Alessandro	Dip. Ingegneria Meccanica, Università di Padova
Pozzobon Fiorella	ST Microelectronics
Po' Riccardo	Eni SpA
Radice Stefano	Solvay-Solexis SpA
Vacca Paolo	Saes Getters SpA

Vernè Enrica

Dip. Scienza Applicata e Tecnologia, Politecnico di Torino