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Ph.D. School - Politecnico di Milano

Regulations of the Ph.D. PROGRAMME in:

Ingegneria dell'Informazione / Information Technology (IT Ph.D.)

Cycle XXXVII

1. General Information

Ph.D. School - Politecnico di Milano

Ph.D. PROGRAMME: Information
Technology Course start: November 2021

Location of the Ph.D. PROGRAMME: Milano Leonardo

Promoter Department: Electronics, Information and Bioengineering [Elettronica, Informazione e Bioingegneria (DEIB)]

Scientific Disciplinary Sectors

- ING-INF/05: Information processing systems
- ING-INF/04: Systems and control engineering
- ING-INF/03: Telecommunications
- ING-INF/01: Electronics
- ING-INF/02: Electromagnetic fields

Ph.D. School Website: **http://www.polimi.it/phd**

Ph.D. Programme Website: **http://dottoratoit.deib.polimi.it**

Areas:

1) Computer Science and Engineering (ING-INF/05: Information processing systems)

2) Electronics (ING-INF/01: Electronics)

3) Systems and Control (ING-INF/04: Systems and control engineering)

4) Telecommunications (ING-INF/03: Telecommunications - ING-INF/02: Electromagnetic fields)

2. General presentation

The Ph.D. Course in Information Technology is organized at the Department of Electronics, Information and Bioengineering (DEIB) and provides the Ph.D. School of the Politecnico di Milano with a significantly large programme, that encompasses all research areas in Computer Science and Engineering, Electronics, Systems and Control, and Telecommunications, and amounts to 18% of the total number of Ph.D. students in the School.

These research fields are of great scientific and technical interest to both industry, and governmental organizations and to the society in general. They are crucial to foster the technological development and digital transformation of our economy and society, as also recognized by the EU research funding policies. This doctorate opens up interesting possibilities of extended study and participation in state-of-the-art research in Information Technology (IT). The many scientific collaborations of DEIB with renowned research institutes in Europe, the United States and worldwide, facilitate access to the world of international research through meetings with scientists and visits to laboratories abroad. The intense industrial collaboration of DEIB in applied research allows the doctoral student to become acquainted with the activities of technologically advanced companies, thus acquiring the elements needed to support a career choice in industrial research as well as at university. DEIB's scientific IT activities are organized along many research lines, organized in four areas: Computer Science and Engineering, Electronics, Systems and Control, and Telecommunications.

Computer Science and Engineering aims at the development of Information Technology and its application to innovative products and services in many fields. The research activity focuses on the following research areas: artificial intelligence, machine learning, data analysis, robotics, information systems, database management, bio-informatics, security and reliability, information design for the web, methods and applications for interactive multimedia, computer vision, advanced software architectures and methodologies, embedded systems design, computer architectures, dependable systems, and computer performance.

The research activities in the **Electronics** area focus on new developments, such as applied nanoelectronics, sensors and diagnostic technologies, genetics and biomedicine, diagnostics of cultural heritage, and astrophysics applications. The research framework is naturally dynamic and evolving, continuously driven by prospects and new initiatives.

The research activity in **Systems and Control** covers various research areas related to control systems science, robotics and industrial automation, nonlinear and networked systems, ecosystems and environmental modelling, and operations research. Specific research topics are: predictive, distributed, and robust estimation and control; model identification and data analysis, data-driven modeling and decision making; automation of automotive, transportation, energy, and manufacturing systems; collaborative and mobile robotics; modeling and control of biological, social, and economic systems; ecology, natural resources management, and climate change; discrete and nonlinear optimization models and algorithms.

Given the interdisciplinary nature of the world of **Telecommunications**, many skills coexist in this area of research. Among these are transmission systems and telecommunication networks, radio and optical wireless transmission, digital signal processing, electromagnetic methods, remote sensing methods and systems, audio and video analysis and production.

The four curricula supported by the aforementioned areas correspond to a traditional partition of IT, but their presence in the same Ph.D. Programme facilitates and encourages interdisciplinary research projects as well. Interdisciplinarity is also exploited through the collaboration with other Ph.D. Programmes, as it is intrinsic to the pervasive nature of IT. Information Technology is bringing about a deep reorganization of industrial structures, with mergers and alliances between electronics, computer, and telecommunication companies. Interesting opportunities in public administrations and personal entrepreneurship are also available.

The Ph.D. course is managed by a Coordinator and a Faculty Board.

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

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

3. Objectives

The Ph.D. Program in IT enrols about 70 students per year, mostly supported by scholarships from public institutions and private companies. After admission, each Ph.D. student chooses a research advisor and a professor of the Doctoral Board as a tutor. Study activities consist of courses and individually guided study.

Advanced courses (in English), reserved to doctoral students and senior graduate students, bring attendees to the frontiers of knowledge in the sectors where DEIB's research is most active. Specific courses on relevant subjects are also organized by various national and international schools regularly accessed by our Ph.D. students. Participation in local and external courses supplies the necessary

knowledge to approach research problems in the most serious and competitive way. Our Ph.D. students also have to follow courses to develop so-called transferable skills, offered by the Ph.D. School of the Politecnico di Milano.

All research is performed under the guidance of a scientific supervisor, or advisor. Throughout the three-year period, the student will have several possibilities to publicly illustrate both his/her studies and research results to DEIB professors and colleagues, and to international audiences, e.g., at international scientific conferences or at school and project meetings. In doing this, the Ph.D. candidates will leverage the soft skills acquired from the Ph.D. School courses, developing a capacity for public speaking as well as improving their ability in oral and written communication.

The Ph.D. Programme is held within a large international framework that includes also joint Programs established with foreign institutions, aimed at training young researchers and Ph.D. students.

4. Professional opportunities and job market

The Ph.D. degree in Information Technology gives access to the highest levels of scientific research in the ICT and related areas. Depending on their interests, their personal inclinations and circumstances, students who have reached the Ph.D. degree may head for a career either in academia or in companies and research institutions, both in Italy and abroad.

Each year, Politecnico di Milano and neighboring universities award post-doctorate positions oriented towards research and teaching. In recent years, the number of positions offered in IT has fulfilled the expectations of the best Ph.D. graduates. As a result of the experience gained with their Ph.D. studies, in seminary courses, conferences, and other education activities, the research graduate is also qualified to undertake teaching activities.

The practice of communicating and working in English, as well as the knowledge of the academic world, acquired during visits and stays abroad, qualifies the Ph.D. graduate for positions offered by the best universities, research centers, and innovative companies worldwide.

As evidence of the interest shown by the industrial sector for this Ph.D. path, many scholarships for graduate students at DEIB have been funded by major companies, to promote research in their respective fields of interest. More than half of IT Ph.D. graduates get a satisfactory position in companies, while about 44% access a career in academia and research centers.

Those aiming for a research career in industry should consider that the globalization of the economy has led to industrial research centers often established in other countries, and organized into intercontinental research structures that impose great mobility on the researchers themselves.

Openings are also available in sectors that are not tied to industry, but to services (e.g., transport planning, natural and human resource management, web services), in important engineering firms, in technical services of government and EU bodies, and in international institutions.

Finally, the skills and results developed in Ph.D. activities may lead, as it happened in the past for about 6% of graduates, to the founding of innovative and creative companies, where it is possible to combine personal interests and entrepreneurial attitudes.

5. Enrolment

5.1 Admission requirements

Both Italian and international citizens may apply. They are requested to have graduated in accordance with the pre-existing laws, Ministerial Decree (D.M.) No. 509 of 03/11/1999, or to hold a Master of Science degree in accordance with D.M. No. 509 of 03/11/1999, or a Master of Science in accordance with D.M. No. 270 of 22/10/2004, or a similar academic title obtained abroad, equivalent for duration and content to the Italian title, having an overall duration of university studies of at least five years.

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

The admission to the Programme is granted upon evaluation of the candidate's curriculum, motivation letters and proposal for a possible Ph.D. research, which candidates will send together with their application to the admission announcement.

5.2 Admission deadlines and number of vacancies

The number of positions is reported in the Call for admission to the 37th Ph.D. cycle Programmes, available at http://www.polimi.it/phd

Both scholarships on general and on specific topics are available, as specified in the call for admission.

Scholarships may be granted from the University and Research Ministry, from Politecnico di Milano, from companies or from the Dipartimento di Elettronica, Informazione e Bioingegneria, based on research project funds.

6. Contents

6.1 Requirements for the Ph.D. title achievement

At the beginning of the Ph.D. activities:

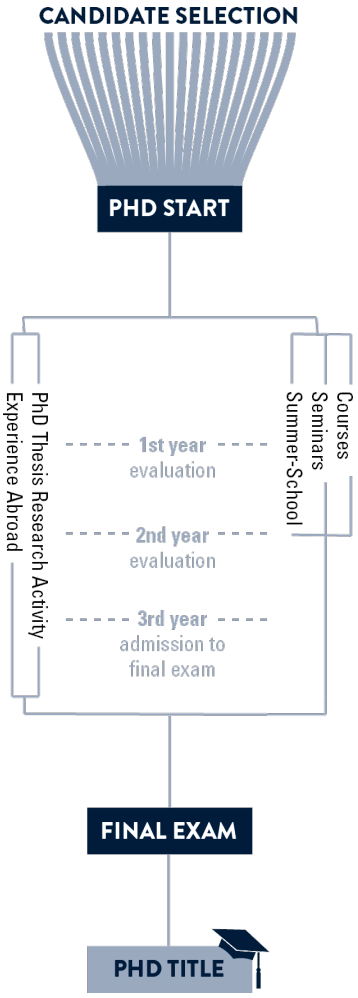
- students have to select a *Supervisor,* or *Advisor,* who will guide and support their research activities aimed at the development of the Ph.D. thesis. The advisor is not necessarily a member of the Faculty Board, and may also belong to an institution different from Politecnico di Milano. The advisor can be supported by one or more co-supervisors.
- the Faculty Board assigns a *Tutor* to each Ph.D. candidate to supervise and assist him/her in the overall training Programme. The tutor is a professor belonging to the Faculty Board. The tutor assists the candidate in the choice of courses to be included in the study plan, which has to be submitted every year for approval to the Coordinator of the Ph.D. Program (see also section 6.4 below). The Faculty Board may assign extra course credits to one or more candidates, in case they need to complete their preparation in specific topics, relevant for their research projects.

All activities related to courses (attendance/evaluation) have to be completed by the end of the second year of the Ph.D. activity.

At the end of each year, each Ph.D. candidate has to pass an evaluation exam to continue the Programme.

At the conclusion of the Ph.D. studies, the Board of Professors evaluates the candidates. Candidates who receive a positive evaluation can submit their theses to two external reviewers. If the evaluation provided by the reviewers is positive (or after the revisions possibly required by them), the candidates can defend their thesis in a final exam, in front of a Committee composed of three members, at least two of which must be external experts.

The set of activities of the Ph.D. student within the Programme are summarized in the following graph:



6.2 Research development

The main aim of all Politecnico di Milano Ph.D. Programmes is the development of a research-oriented mind-set in the candidates, with general research-oriented skills and expertise in a specific research topic. To this end, candidates must develop the ability to formulate and solve problems in complex contexts, to perform deep problem analysis, to identify original solutions and evaluate their applicability in practical contexts. These skills provide the Ph.D. candidates with major opportunities of development in their research both in the academic field and in public and private organizations.

Ph.D. candidates are required to develop an original research contribution, coherent with the research topics developed in the Department where the Ph.D. Program is carried out. The Ph.D. thesis must thus contribute to increase the knowledge in the candidate's research field. The original research results are collected in the Ph.D. thesis, where the candidate's contribution is positioned in relation to the state of the art in the specific research field.

The Ph.D. research is developed under the guidance of the supervisor, who supports the candidate in the setting-out and in the everyday activities related to the thesis development. The supervisor can be supported by one or more co-supervisors.

Further activities intended to develop the candidate's personal skills and research expertise are encouraged during the Ph.D. path.

Candidates must acquire the ability to present and discuss their work in their research community. Consequently, both participation in international conferences and publication of the research results in peer-reviewed journals are encouraged. A minimum number of publications is required by the end of the Ph.D. path.

The Ph.D. Program favors the candidates' research interactions with other groups in their research field, preferably abroad. Research visits of at least three months are strongly encouraged, since through them the candidates can acquire further skills to develop their research work and thesis.

The duration of the program is normally three years.

6.3 Objectives and general framework of the teaching activities

The Ph.D. Programmes and the Ph.D. School activate teaching forms of different kinds and credit value, including courses, seminars, project workshops, and laboratories. Teaching activities cover both basic research issues (problems, theories, methods) that represent the founding element of the Ph.D. Programme and identify its cultural position, and research issues connected with the problems developed in the theses, which are deeply studied and investigated.

Lessons are usually offered in English.

The Ph.D. School of the Politecnico di Milano proposes a set of courses aiming to train 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 in order to respond to the rapidly evolving needs of the global economy and society at large.

The Ph.D. Programme in Information Technology offers courses, held at DEIB by internal or foreign professors, in the four areas in which it is structured, *i.e.*, Computer Science and Engineering, Electronics, Systems and Control, and Telecommunications, as well as some cross-area courses. All courses are worth 5 credits.

Candidates must earn in the first two years a **minimum of 25 ECTS** credits from courses consistent with their Ph.D. activities, among which at least 10 credits should be obtained from characterising Ph.D. courses offered by the Ph.D. Programme in Information Technology, whereas at least 10 credits should be obtained from courses on soft and transferable skills proposed by the Ph.D. School, and at most 5 credits may be taken from external Ph.D. courses, *e.g.*, from other Ph.D. Programmes or from Ph.D. Summer Schools. All the abovementioned courses should provide an evaluation of the student's performance for the corresponding credits to be assigned. Other activities, for which no credits are assigned, fall within the scientific activities which the Faculty Board takes into account in the overall evaluation. Courses from the Master Degree may be inserted in the curriculum of the student, in agreement with the Supervisor and the Tutor, but do not contribute to the acquisition of credits. The Faculty Board may assign extra course credits to candidates, in case they need to complete their preparation in specific topics, relevant for their research projects.

The table below summarizes the candidate's path (as regards coursework activities). At the same time, the Program assumes that the candidates are devoted to research activity in a continuous way, following the lead of their supervisors, and of the Faculty Board.

First/Second Year

Courses	Details or reference	Number of credits
Courses characterizing the Ph.D. program	See Table A (details in Ph.D. School website)	min 10
Ph.D. School Courses	See Ph.D. School website	min 10
Other Ph.D. courses	External courses with evaluation	max 5
Other activities	Seminars, courses without evaluation, to be agreed in advance with the Tutor. Language courses.	No credits

Third year

In the third year, the candidates should devote their time entirely to the research and to the finalization of their Ph.D. thesis.

The prior approval of the study plan by both the Tutor and the Coordinator is mandatory.

Ph.D. Course List

A) Characterising Courses of the Ph.D. Programme in Information Technology (Table A).

The acquisition of at least 10 credits from these courses is mandatory.

The scheduled course planning for the academic year 2021-22 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. The programmes and schedules of the courses organized by this Ph.D. Programme are available from http://dottoratoit.deib.polimi.it

Table A: PHD COURSES 2021-22 CHARACTERISING THE PHD PROGRAM

Course title	*Professor in charge*	*Lecturers*	*Tentative schedule*	*Lang*	*CFU*
Advanced MEMS gyroscopes	LANGFELDER GIACOMO	Giacomo Langfelder	Jan.-Feb. 2022	ENG	5
Statistical Signal Processing and Supervised Learning	SPAGNOLINI UMBERTO	Umberto Spagnolini	Feb.-Mar.2022	ENG	5
Data and Results Visualization	LOIACONO DANIELE	Daniele Loiacono	Dec. 2021	ENG	5
Signal integrity in very-high speed digital circuits	GERACI ANGELO	Angelo Geraci	June 20-24, 2022	ENG	5
Advances in Radiation Detectors, Microelectronic Readout and Applications	CARMINATI MARCO	Marco Carminati, 2 credits Carlo Fiorini, 2 credits Valerio Re, Università di Bergamo, 1 credit	Feb. 2022	ENG	5
Embedded and Edge Artificial Intelligence	ROVERI MANUEL	Manuel Roveri	Jan.-Feb. 2022	ENG	5
Model Predictive Control	FARINA MARCELLO	Marcello Farina, 2 credits Lorenzo Fagiano, 2 credits Riccardo Scattolini, 1 credit	Nov.-Dec. 2021	ENG	5
Reliable Computing Systems	CASSANO LUCA MARIA	Luca Maria Cassano, 3 credits Antonio Rosario Miele, 1 credit Cristiana Bolchini, 1 credit	Spring 2022	ENG	5
Distributed algorithms for optimization and control over networks	PRANDINI MARIA	Maria Prandini, 2 credits Alessandro Falsone, 1 credit Simone Garatti, 1 credit Kostas Margellos, University of Oxford, UK, 1 credit	Feb. 2022	ENG	5
Advanced Deep Learning Models and Methods	BORACCHI GIACOMO	Giacomo Boracchi, 1 credit Matteo Matteucci, 1 credit Alessandro Giusti, IDSIA, CH, 1 credit Jonathan Masci, NNAISENSE SA, CH, 1 credit Luigi Malagò, RIST, Romania, 1 credit	Feb. 21-25, 2022	ENG	5
Machine Learning Methods for Communication Networks and Systems	MUSUMECI FRANCESCO	Francesco Musumeci	Dec. 2021	ENG	5
Online Learning and Monitoring	TROVO' FRANCESCO	Francesco Trovò, 2 credits Giacomo Boracchi, 3 credits	Feb. 2022	ENG	5

Introduction to Quantum Computing[1]	PELOSI GERARDO	Gerardo Pelosi, 3 credits Alessandro Barenghi, 2 credits	Feb. 2022	ENG	5
Reinforcement Learning	RESTELLI MARCELLO	Marcello Restelli, 2 credits Alberto Maria Metelli, 3 credits	Mar.-May 2022	ENG	5
Introduction to Quantum Mechanics and to Quantum Information[1]	MARTINELLI MARIO	Mario Martinelli, 3 credits Gerardo Pelosi, 2 credits	May-June 2022	ENG	5
Design of Real-Time and Mixed-Criticality Systems	FORNACIARI WILLIAM	Zhishan Guo, University of Central Florida, US, 3 credits Federico Reghenzani, 2 credits	May - June 2022	ENG	5
Organic Electronics: principles, devices and applications	NATALI DARIO	Dario Natali	Jan-Feb. 2022	ENG	5
Parallel Computing on Traditional (core-based) and Emerging (GPU-based) Architectures through OPENMP and OPENACC / OPENCL	BREVEGLIERI	Maurizio Cremonesi, CINECA, 3 credits researchers of the CINECA staff (TBD), 2 credits	May-June 2022	ENG	5
Object-Oriented Modelling and Simulation	CASELLA FRANCESCO	Francesco Casella, 4 credits Gianni Ferretti, 1 credit	Oct. 2022	ENG	5
IT perspective on Business Process Management	PLEBANI PIERLUIGI	Pierluigi Plebani, 3 credits Monica Vitali, 2 credits	April/May 2022	ENG	5

[1] It is possible to insert in the Study Plan only one of these two courses: Introduction to Quantum Computing and Introduction to Quantum Mechanics and to Quantum Information.

B) Ph.D. School Courses

The Ph.D. School of the Politecnico di Milano proposes a set of general and inter-doctoral courses aimed 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 in order to respond to the rapidly evolving needs of the global economy and society at large. The acquisition of at least 10 credits from these courses is mandatory.

The list of Ph.D. School courses activated for the 2021-22 A.Y. is available on the website

http://www.dottorato.polimi.it/en/during-your-phd/phd-level-courses/

The following courses are suggested to IT PhD candidates:

COURSE TITLE	PROFESSOR IN CHARGE
Ethics in Research	Aliverti
Advanced Interaction Skills for Academic Professionals	Arnaboldi
English for Academic Communication	Biscari
Epistemology of Scientific and Technological Research (Technologies Reshaping Humans)	Chiodo
Professional Communication	Di Blas
The Copernicus Green Revolution for Sustainable Development	Gianinetto
Sustainability Metrics, Life Cycle Assessment and Environmental Footprint	Lavagna
Project Management (in Action)	Mancini
La comunicazione nella scienza	Paganoni
Practicing research collaboration / La pratica della collaborazione nella ricerca	Pizzocaro
Science, Technology, Society and Wikipedia	Raos
Introduction to academic research	Volontè

PhD candidates can choose also other courses from the PhD School list of courses. In particular, participation in courses on research management and project management are encouraged.

C) Other Ph.D. courses

A maximum of 5 credits can be obtained by choosing among courses provided by other Ph.D. Programmes at Politecnico di Milano and/or external Institutions.

D) Preparatory courses

If the Advisor and the Tutor find it useful or necessary for the candidate to attend preparatory courses (chosen among the courses activated 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 path. The credits acquired in this way will be considered as additional to the mandatory credits to be acquired with Ph.D. courses.

A preparatory course for early stage researchers, entitled "Being a researcher", is available on line as a MOOC at https://www.pok.polimi.it/, where also other preparatory course of general interest can be found.

E) Specialistic courses, long-training seminars

The attendance of specialistic courses, workshops, schools, seminar cycles is strongly encouraged and (if these seminars, workshops are certified and evaluated) may earn the candidates further credits, subject to the prior approval of the study plan submitted by the candidate. These courses and workshops can be inserted in the study plan, even if they are not evaluated (and therefore not qualified as credits), as optional "additional courses".

F) Language courses

Language courses (English, Italian as a foreign language, German, Chinese, other European languages) are offered by the Politecnico di Milano to Ph.D. candidates and enrolled students in general. The detailed list and calendar are published on the Politecnico web site before the beginning of each semester. The IT Ph.D. Programme supports the enrolment in these courses, refunding the registration fee.

6.4 Presentation of the study plan

Ph.D. candidates must submit a study plan, which may be revised periodically, in order to accommodate for possible modifications, or needs motivated by the development of their Ph.D. career. The study plans must be approved by the Tutor and by the Ph.D. program vice-Coordinator in the Area of the Ph.D. candidate.

6.5 Yearly evaluations

Candidates present their work to the Faculty Board at least once a year. In particular, the candidates must undergo 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 for the following year. Candidates who do not pass the exam are qualified either as "Repeating candidate" (Er) or "Unable 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).

Should the Faculty Board directly assign an exclusion evaluation (Ei) without a previous repetition year, the decision must be properly motivated, and validated by the Ph.D. School.

After the final year, candidates who have achieved sufficient results but need more time to conclude their research work and write their theses may obtain the admission to a further year.

6.5 Ph.D. thesis preparation

The main objective of the Ph.D. career is the development of an original research contribution. The Ph.D. thesis is expected to contribute to the advancement of the knowledge in the candidate's research field.

The Ph.D. study and research work is carried out, full time, during the three years of the Ph.D. course. Stages or study periods in (Italian or international) companies or external institutions may complete the candidate's preparation.

The thesis must be coherent with the research issues developed in the Department where the Ph.D. Programme is developed.

The candidate must present an original thesis, discussing its contribution to the state of the art in the research field in the research community.

The Ph.D. research is developed following the lead of a supervisor, who supports the candidate in the setting out and in the everyday activities regarding the thesis development.

At the conclusion of the Ph.D. studies, the Faculty Board evaluates the candidates. Candidates who receive a positive evaluation submit their theses to two external reviewers for refereeing. If the evaluation provided by the reviewers is positive (or after the revisions required by the external reviewers), the candidates defend their thesis in a final exam, in front of a Committee composed of three members (at least two of which must be external experts).

6.7 Laboratories

The Dipartimento di Elettronica, Informazione e Bioingegneria hosts many laboratories for Computer Science and Engineering, Systems and Control, Electronics, and Telecommunications, and participates in interdepartmental laboratories. Professional technicians continuously update the laboratory infrastructures and assist researchers and students.

The list of laboratories is provided on the following website:
https://www.deib.polimi.it/eng/laboratories

6.8 IT Ph.D. Secretariat

This Office provides information about teaching activities and support about the formal aspects of the Ph.D. programme. In particular, candidates are informed about deadlines to be respected, how to enter the study plans, training, etc. The Office provides information about the possibility of joining a double doctorate course in agreement with foreign universities.

Foreign students are also supported by specific services that offer support to cope with administrative issues (visa, residence permits, documents, and so on to access Italian language courses, and housing.

E-mail address: phd-inf@polimi.it

Information Technology Ph.D. head of administration

Fabio Conti – Tel. 02 2399 3431

E-mail address: fabio.conti@polimi.it

7. Internationalization and interdisciplinarity

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

Long stays are possible for up to 18 months. Scholarships are increased by 50% (of the base scholarship as defined at national level) for a maximum of 6 months abroad. The external visit requires a formal approval by the Faculty Board. Additional funds for long travel/visits abroad may be available from various Ph.D. fundings. Additional support may come from research funds and from teaching assistant activity (≤ 40 hours/year).

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. Program website.

Interaction with non-academic sectors provides significant benefits to doctoral candidates as well as to research- and innovation-intensive employment sectors. Direct exposure to the challenges and opportunities in non-academic sectors of economy and society at large is fostered by networking, connectivity, inter-sectoral mobility and wide access to knowledge. In particular, the Ph.D. Programme in Information Technology collaborates with the following research agencies and/or industrial partners.

INFN ISTITUTO NAZIONALE DI FISICA NUCLEARE	Research Institution
TELECOM ITALIA S.P.A.	R&D Company
IIT - ISTITUTO ITALIANO DI TECNOLOGIA	Research Institution
ST MICROELECTRONICS S.R.L.	R&D Company
MICRON SEMICONDUCTOR ITALY S.R.L.	R&D Company
RSE - RICERCA SUL SISTEMA ENERGETICO S.P.A.	R&D Company
EIT DIGITAL	Research Institution
IBM ITALIA	R&D Company
CNR-ITIA	Research Institution
ABB	R&D Company
PIRELLI	R&D Company
SECURITY REPLY S.R.L.	R&D Company
ENI	R&D Company

Attachment A1 – Ph.D. Programme Coordinator

Short CV of Programme Coordinator

Barbara Pernici is full professor in Computer Engineering at the Politecnico di Milano since 1993. She leads the Information Systems group in the Department of Electronics, Information and Bioengineering. Her research interests include adaptive information systems, data quality, IS energy efficiency, and extracting located images from social media. She has published more than 60 papers in international journals and about 350 papers at international level. She has lead the information systems group of Politecnico di Milano in many projects, among which the European FP7 projects on energy efficiency ECO_2Clouds and GAMES (Green Active Management of Energy in Service Centers, where she was the scientific leader for the project). She currently participates in the EU H2020 project CROWD4SDG, as PoliMi unit leader. She was an elected chair of TC8 Information Systems of the International Federation for Information Processing (IFIP), of IFIP WG on Information Systems Design, vice-chair of the IFIP WG on Services-Oriented Systems, and chair of the Steering Committee of the international Conference on Advanced Information Systems Engineering (CAiSE). She has chaired or cochaired main conferences, as general chair or program chair, including CAiSE, ER, BPM, ICSOC, Coopis, tracks in ICSE and ICIS. She is responsible of the editorial board of PoliMi-SpringerBriefs and she is member of the editorial boards of ACM TWeb, IEEE Trans. on Services Computing, and Business & Information Systems Engineering Journal. She was Dean of the Ph.D. School of Politecnico di Milano and member of the Academic Senate of Politecnico di Milano.

Web site: http://pernici.faculty.polimi.it/

Attachment A2 – Ph.D. Faculty Board

Name	Affiliation	Scientific Disciplinary Sector
PERNICI BARBARA (coordinator)	DEIB	ING-INF/05
ALIPPI CESARE	DEIB	ING-INF/05
AMIGONI FRANCESCO	DEIB	ING-INF/05
BARESI LUCIANO	DEIB	ING-INF/05
BASCETTA LUCA	DEIB	ING-INF/04
BERTUCCIO GIUSEPPE	DEIB	ING-INF/01
CAPPIELLO CINZIA	DEIB	ING-INF/05
CASTELLETTI ANDREA	DEIB	ING-INF/04
CESANA MATTEO	DEIB	ING-INF/03
DERCOLE FABIO	DEIB	ING-INF/04
FAGIANO LORENZO	DEIB	ING-INF/04
FERRIGNO GIANCARLO	DEIB	ING-INF/06
FERRARI GIORGIO	DEIB	ING-INF/01
GARATTI SIMONE	DEIB	ING-INF/04
GATTI NICOLA	DEIB	ING-INF/05
GERACI ANGELO vice-coordinator Electronics Area	DEIB	ING-INF/01
MARTELLI PAOLO	DEIB	ING-INF/03
MATERA MARISTELLA	DEIB	ING-INF/05
MIRANDOLA RAFFAELA	DEIB	ING-INF/05
MONTI GUARNIERI ANDREA	DEIB	ING-INF/03
PERNICI BARBARA	DEIB	ING-INF/05
PIRODDI LUIGI vice-coordinator Systems and Control Area	DEIB	ING-INF/04
RECH IVAN	DEIB	ING-INF/01
RIVA CARLO vice-coordinator Telecommunications Area	DEIB	ING-INF/02
SOTTOCORNOLA SPINELLI ALESSANDRO	DEIB	ING-INF/01
SILVANO CRISTINA vice-coordinator Computer Science and Eng. Area	DEIB	ING-INF/05
TANCA LETIZIA	DEIB	ING-INF/05
TORNATORE MASSIMO	DEIB	ING-INF/03