



**POLITECNICO**  
MILANO 1863

**PhD School - Politecnico di Milano**  
**Regulations of the PhD PROGRAM in:**

**Information Technology**

**Cycle XXXIV**

# 1. General Information

PhD School - Politecnico di Milano

PhD PROGRAM: Information Technology

Course start: November 2018

Location of the PhD PROGRAM: Milano Leonardo

Promoter Department: 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

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

PhD PROGRAM 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 PhD Course in Information Technology is organized within the Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB) and is part of the PhD School as a significantly large Program, including all research areas in Computer Science and Engineering, Electronics, Systems and Control, Telecommunications, with 18% of the total number of PhD students in the School.*

*These fields of research are of great scientific and technical interest to both industry, governmental organizations, and to the society in general. The doctorate opens interesting possibilities of extended study and participation in high level research in Information Technology (IT). Scientific collaboration of DEIB with renowned research institutes in Europe, the United States and worldwide, facilitates the entrance into the world of international research through meetings with scientists and visits to laboratories abroad. 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 or in university.*

*DEIB's scientific activities in IT 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 develops along these research areas: artificial intelligence, machine learning, 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, computer performance.

**Electronics:** the research activities 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 dynamical and evolves, continuously driven by prospects and new initiatives.

**Systems and Control:** the research activity covers various fields related to control system science, systems theory, ecology, operations research, and electrical and electronic measurements. Despite the rich variety of topics, both theoretical and application-oriented, a unifying system viewpoint is generally adopted, which enables the analysis, the management, and the design of complex systems (not only in the area of automation in a strict sense), through the powerful theoretical tools of mathematical modeling.

**Telecommunications:** given the interdisciplinary nature of the world of the telecommunications, in this section many competences coexist, among which: 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 mentioned areas correspond to a traditional partition of IT, but their presence in the same PhD Program makes interdisciplinary research projects possible. Interdisciplinarity is also exploited through collaboration with other PhD Programs, as it is intrinsic to the pervasive nature of IT. Information Technology is bringing about a deep reorganization of industrial structures, with merging and alliances between electronics, computer, and telecommunication companies, and with the management of keyword. Interesting opportunities towards public administrations and personal entrepreneurship are also open.*

*The PhD course is run by a Coordinator and a Faculty Board.*

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

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

### 3. Objectives

The PhD Program in IT enrolls, every year, about 60 students, mostly supported by scholarships from public institutions and private companies. After admission, each PhD 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 the attendants 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 PhD students. The participation in local and external courses supplies the necessary knowledge to approach research problems in the most serious and competitive way. Our PhD students also have to follow courses to develop so-called transferable skills, offered by the Polimi PhD School.

All research is performed under the guidance of a scientific supervisor, or advisor. Throughout the three-year period, the student will have the 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 schools and project meetings. In doing this, possibly supported by soft skills acquired from the PhD School courses, the students will develop a capacity for public speaking as well as improving their ability in oral and written communication.

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

### 4. Professional opportunities and job market

The PhD 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 PhD 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 offered positions in IT has fulfilled the expectations of the best PhD graduates. As a result of the experience gained with their PhD studies, in seminary courses, conferences, and other education activities, the research graduate is also qualified to undertake teaching activities.

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

As evidence of the interest shown by companies for this PhD track, many scholarships for graduate students at DEIB have been funded by major industrial companies, to promote research in their respective fields of interest. About half of our PhD graduates gets 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 to 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, in international institutions.

Finally, the competence developed in brilliant PhD activities may lead, as it happened in the past for about 6% of graduates, to the establishment of innovative and creative companies, where it is possible to combine personal interests and entrepreneurship attitudes.

## 5. Enrollment

### 5.1 Admission requirements

Both Italian and International 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, having 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 PhD School website for details.

The admission to the Program is granted upon evaluation of the candidate's curricula, motivation letters, and an illustrative report about the development of a possible PhD research, which candidates will send contextually 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 34<sup>th</sup> PhD cycle Programs, available at <http://www.polimi.it/phd>

Scholarships, both on general and on specific themes, are available, in accordance with what is specified in the call for admission.

Scholarships may be granted from the University and Research Ministry, from Politecnico, from companies or from the Department, based on research project funds.

## 6. Contents

### 6.1 Requirements for the PhD title achievement

At the beginning of the PhD activities:

- the students have to select a *Supervisor*, or *Advisor*, who will guide and support their research activities aimed at the development of the PhD 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 PhD candidate to supervise and assist him/her in the overall training Program. The tutor shall be 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 for approval to the Coordinator of the PhD Program (see also section 6.4 below).

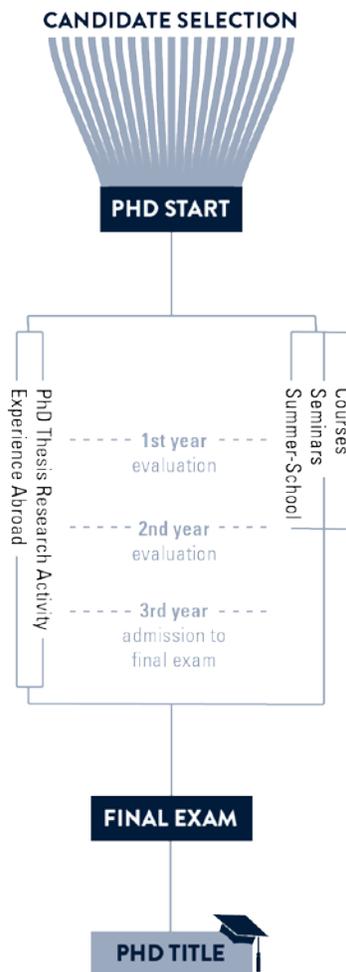
All activities related to courses (attendance/evaluation) have to be completed by the end of the second

year of the PhD activity.

At the end of each year, each PhD candidate has to pass an evaluation to continue the Program.

At the conclusion of the PhD 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 PhD student within the Program are summarized in the following graph:



## 6.2 Research development

The main aim of all Politecnico di Milano PhD Programs is the development in the candidates of a research-oriented mind-set, with expertise and skills in a specific research topic. To this end, candidates develop a problem-solving capability in complex contexts, including the capacity of performing deep problem analysis, identifying original solutions, and evaluating their applicability in practical contexts. These skills provide the PhD candidates with major opportunities of development in their research both in the academic field, and in public and private organizations.

PhD candidates are required to develop an original research contribution. The PhD thesis must thus contribute to increase the knowledge in the candidate's research field. Besides, it has to be coherent with the research topics developed in the Department where the PhD Program is carried out.

The original research results are collected in the PhD thesis, where the candidate's contribution is put in perspective with respect to the research state of the art in the specific research field.

The PhD research is developed under the guidance of the Advisor, who supports the candidate in the setting-out and in the everyday activities related to the thesis development.

Further activities intended to develop 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 their research community. Consequently, both the participation to international conferences and the publication of the research results in peer-reviewed journals are encouraged. A minimum number of publications is required by the end of the PhD path.

The PhD 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, as through them the candidates may acquire further skills to develop their research work and thesis.

The duration of the program is usually three years.

### **6.3 Objectives and general framework of the teaching activities**

The PhD Programs and the PhD School activate teaching forms of different kind and credit value, including courses, seminars, project workshops, laboratories. Teaching activities cover both the basic research issues (problems, theories, methods) that represent the founding element of the PhD Program 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.

Structured teaching activities allow to earn ECTS credits. Candidates must earn in the first two years a minimum of 25 ECTS credits from courses coherent with their PhD activities, among which at least 10 credits should be obtained from PhD courses characterizing the PhD Program in Information Technology (held at DEIB by internal or foreign Professors), at least 10 credits should be obtained from courses about soft and transferable skills proposed by the PhD School, and 5 or less credits may be taken from external PhD courses, e.g., from other PhD Programs, or from Summer Schools. All the mentioned courses should provide an evaluation of the student's performance to assign the corresponding credits. Other activities, typically specialized and for which it is difficult to evaluate the learning and its quantification, fall within the scientific activities of 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 foresees 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 PhD program	See table a and School website	min 10
PhD School Courses	See table B and Program website	min 10
Other PhD courses	External courses with evaluation	max 5
Other activities	Seminars, courses without evaluation, to be agreed in advance with the Tutor	No credits

### Third year

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

### PhD Course List

**A)** The PhD Program in Information Technology organizes the **Characterising Courses** listed in table A. For the admission to the final exam, the acquisition of at least 10 credits in this list within the first two years is **mandatory**.

The scheduled course planning for the academic year 2018-2019 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. Programs and schedule of the courses organized by this PhD Program are available from <http://dottoratoit.deib.polimi.it>

**Table A: PHD COURSES CHARACTERISING THE PHD PROGRAM**

Name of the Course	Professor	Schedule	Language	Credits
ADVANCED TOPIC ON RECONFIGURABLE FPGA-BASED SYSTEMS DESIGN	Marco Domenico Santambrogio, Antonio Rosario Miele	1 week in November 2018	English	5
ADVANCED TOPICS IN COMPUTER SECURITY	Stefano Zanero	June 2019	English	5
ADVANCES IN DEEP LEARNING WITH APPLICATIONS IN TEXT AND IMAGE PROCESSING	Matteo Matteucci, Giacomo Boracchi, Alessandro Giusti (IDSIA)	Mar/Apr 2019	English	5
BEYOND CMOS COMPUTING	Daniele Ielmini, Elisabetta Chicca (Bielefeld University)	Tentatively December 2018	English	5

COMPLEX NETWORKS	Danilo Ardagna, Ana Paula Couto da Silva (Universidade Federal de Minas Gerais, Brazil)	Jan/Feb 2019	English	5
CONCURRENT OBJECT- ORIENTED PROGRAMMING	Bertrand Meyer	Fall semester 2018	English	5
DATA AND INFORMATION QUALITY	Cinzia Cappiello, Barbara Pernici	May 2019	English	5
DATA-DRIVEN APPROACHES TO UNCERTAIN OPTIMIZATION: THEORY AND APPLICATIONS	Simone Garatti, Marco C. Campi (UniBS)	Spring 2019	English	5
DIGITAL CIRCUITS AND SYSTEMS FOR DSP AND FPGA-BASED PROCESSING	Angelo Geraci	June 2019	English	5
EMBEDDED SENSOR SYSTEMS	Federica Alberta VILLA	Jan/Feb 2019	English	5
FEEDBACK CONTROL FOR COMPUTING SYSTEMS	Alberto Leva, Federico Terraneo	Jan 2019	English	5
FIBER OPTIC SENSING	Paolo Martelli	Nov 2018	English	5
FORMAL LANGUAGES AND AUTOMATA TO MODEL COMPLEX STRUCTURES: TWO- DIMENSIONAL AND OPERATOR PRECEDENCE LANGUAGES	Matteo Pradella, Violetta Lonati (UNIMI)	Feb 2019	English	5
GENOMIC COMPUTING	Marco Masseroli, Mattia Pelizzola (IIT)	Spring 2019	English	5

HIGH RESOLUTION ELECTRONIC MEASUREMENTS IN NANO-BIO SCIENCE	Marco Sampietro, Giorgio Ferrari, Marco Carminati	Jan/Feb 2019	English	5
HYBRID SYSTEMS	Maria Prandini, John Lygeros (ETH Zurich), Antoine Girard (L2S CNRS, CentraleSupélec)	June 2019	English	5
INTELLIGENT MULTIAGENT SYSTEMS	Francesco Amigoni	Apr/May 2019	English	5
INTERNET ECONOMICS	Carmine Ventre (University of Essex, UK)	Jan 2019	English	5
LEARNING SPARSE REPRESENTATIONS FOR IMAGE AND SIGNAL MODELING	Giacomo Boracchi	Feb 2019	English	5
LOCATION, NAVIGATION AND COOPERATIVE SYSTEMS FOR SMART MOBILITY	Monica Barbara Nicoli, Francesco Paolo Deflorio (Polito), Stefano Savazzi (CNR)	Jan/Feb 2019	English	5
NONLINEAR SYSTEM IDENTIFICATION	Luigi Piroddi, Simone Garatti, Simone Formentin, Lorenzo Fagiano, Giulio Panzani	Jan/Feb 2019	English	5
NUCLEAR MICROELECTRONICS	Carlo Fiorini, Valerio Re (UNIBG)	Jan/Feb 2019	English	5
NUMERICAL METHODS FOR ELECTROMAGNETICS	Guido Gentili	Nov-Dec 2018, Jan 2019	English	5

STOCHASTIC PROGRAMMING	Ola Jabali, M. Gendreau (École Polytechnique de Montréal)	Spring 2019	English	5
STREAM AND COMPLEX EVENT PROCESSING IN THE BIG DATA ERA	Alessandro Margara, Gianpaolo Cugola, Emanuele Della Valle	Second semester	English	5
VIRTUAL AND MIXED REALITY	Pier Luca Lanzi, Daniele Loiacono	May 2019	English	5

**B)** The PhD School of Politecnico di Milano proposes a set of general and Interdoctoral courses aimed at training the PhD 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** within the first two years. The list of PhD School courses activated for the 2018-2019 Academic Year is available in the following table and on the website <http://www.dottorato.polimi.it/en/during-your-phd/phd-school-courses>.

Course name	Professor
A - Innovative Teaching Skills	Magli
A - Research Skills	Sciuto
A - Scientific Models: Conceptual Foundations and Philosophical Issues	Valente
A - The Process of Research	Volontè
C - Advanced Interaction Skills for Academic Professionals	Arnaboldi
C - Issue Mapping	Ciuccarelli
C - La diffusione della Ricerca	Paganoni
C - Professional Communication	Di Blas
C - Science, Technology, Society, and Wikipedia	Raos
C - Scientific Communication in English	Biscari
E - Ethical Aspects of Research on Dual-Use Products	Masarati
E - Ethics in Research	Aliverti
E - Sulla Responsabilità della Tecnica	Ossi
E - Technology and Society	Crabu
E - The ageing society: a challenge for technological and social innovation	Ranci Sabatinelli
I - Industrial Skills	Biscari
I - Project Management (in Action)	Mancini
I - Project Management Basics	Fuggetta
I - Project Management PMI-CAPM Certification Preparation	Fuggetta

I - Strategic Decision Making	Ferretti
P - Design Thinking	Deserti
P - Empowering Imagination	Chiodo Schiaffonati
S - Resource Planning and Management within Sustainable Development	Colombo
S - Sustainability Metrics, Life Cycle Assessment and Environmental Footprint	Lavagna
X - Complementary doctoral skills	Biscari

### **C) Other PhD courses**

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

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

### **PREPARATORY COURSES**

If the Advisor and the Tutor find it useful or necessary that the candidate attends preparatory courses (chosen among the activated courses at the Politecnico di Milano) the Faculty Board of the PhD PROGRAM 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 PhD courses.

### **SPECIALISTIC COURSES, LONG-TRAINING SEMINARS**

The attendance of Specialist Courses, Workshops, Schools, Seminars cycles is strongly encouraged and (if these seminars, workshops are certified and evaluated) may permit to acquire credits according to the modalities established by the Faculty Board and previous 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 teaching”.

## **6.4 Presentation of the study plan**

PhD candidates must submit a study plan, which may be revised periodically, in order to accommodate for possible modifications, or to needs motivated by the development of their PhD career. The study plans must be approved by the Tutor and by the PhD program Coordinator, according to the modalities established by the Faculty Board.

## **6.5 PhD thesis preparation**

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

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

The resulting theses need to be coherent with the research issues developed in the Department where the PhD Program is developed.

The candidate must present an original thesis, discuss its contribution to the state of the art in the

research field in the research community.

The PhD research is developed following the lead of the Advisor, who supports the candidate in the setting out and in the everyday activities regarding the thesis development.

## 6.6 Yearly evaluations

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

The third year evaluation establishes the candidate's admission to the delivery of the thesis to reviewers, who may give access to the final PhD defense, suggest improvements to the thesis, and so possible delays up to 6 months for the discussion, or evaluate the candidate as not admissible to the thesis discussion. As a result of each successful annual evaluation, the candidates receive an evaluation in the range: [A,B,C,D, Not Admitted]. Candidates who do not pass the exam can be qualified either as "Repeating candidate"(Er) and will be allowed to repeat the year once, or as "unable to carry on the PhD (Ei)" and will have to leave the PhD Program.

After the final year, candidates who have achieved sufficient results but need more time to draw up their theses, may obtain a prorogation of up to 12 months.

## 6.7 Laboratories

The Department hosts 30 laboratories for Computer Science and Engineering, Systems and Control, Electronics, Telecommunications, and advanced interdisciplinary studies. Professional technicians continuously update the laboratory infrastructures and assist researchers and students.

The list of laboratories is provided below:

<b>Computer Science and Engineering</b>
AIRLab - Artificial intelligence and robotics
ARCSLab - Adaptable, Relational and Cognitive Software Environments
ATGLab - Assistive Tecnology Group
Bioinformatics and Web Engineering Lab
DEEPSE Lab - DEpendable Evolvable Pervasive Software Engineering
HOC Lab - Hypermedia Open Center
I3Lab - Innovative Interactive Interfaces
ISOLab - Information Systems Open
NECST Lab - Novel, Emerging Computing System Technologies
NESLab - Networked Embedded Software Lab
WEMSY Lab - Wireless EMbedded SYstems
<b>Electronics</b>
Analog integrated circuit design Lab
Digital electronic systems Lab
Electron devices Lab
MEMS and microsensors Lab
Radiation detectors and low-noise electronics Lab
SPADLab - Single-photon detectors and applications

<b>Systems and Control</b>
DAISY Lab - Distributed Automaitlon Systems
MERLIN Lab - Automatic Control
MOVE Lab - Motor Vehicle Electronic Control
<b>Telecommunications</b>
ANTLab - Research and experimental laboratory of wireless network and networked embedded systems
BONSAI Lab - Broadband Optical Networks, Security, and Advanced Internet
GEOSAR Lab - Geophysical and Radar Sounding
ISPLab - Image and Sound Processing
Musical Acoustics Lab
Photonic Devices Lab
PoliCom Lab - Optical Communications
Sound and Music Computing Lab
Spino d'Adda satellite station
WISYLAB lab - Wireless system

## 6.8 Information Technology PhD Secretariat

From this Office candidates receive information about teaching and support about the formal aspects of the PhD program; in particular, they 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 courses in agreement with foreign universities.

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

Francesca Clemenza – Phone: 02 2399 4209

E-mail address: [phd-inf@polimi.it](mailto:phd-inf@polimi.it)

### Information Technology PhD head of administration

Fabio Conti – Tel. 0223993431

E-mail address: [fabio.conti@polimi.it](mailto:fabio.conti@polimi.it)

## 8. Internationalization and inter-sectoriality

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% for a maximum of 6 months abroad. The stay requires a formal approval by the Faculty Board. Additional funds for long travel/stays abroad may be available from various PhD fundings. Other money may come from the advisor's funds and from teaching activity ( $\leq 40$  hours/year).

Politecnico di Milano supports joint PhD paths with International Institutions, as well as Joint and Double PhD Programs. Further information is available on the PhD School website and on the PhD Program website.

More specifically, the PhD Program in Information Technology collaborates with

<i>ECOLE POLYTECHNIQUE DE MONTREAL</i>	<i>Canada</i>
<i>QATAR UNIVERSITY</i>	<i>Qatar</i>
<i>UNIVERSIDADE DE LISBOA</i>	<i>Portogallo</i>

Interaction with and exposure to 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 the economy and society at large is fostered by networking, connectivity, inter-sectoral mobility and wide access to knowledge. In particular, the PhD PROGRAM in Information Technology collaborates with the following Research Agencies and/or Industrial partners.

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

## Attachment A1 – PhD PROGRAM Coordinator

### Short CV of PROGRAM Coordinator

Andrea Bonarini (Milano, 1957). Laurea (Master) in Electronics Engineering (Computer Engineering area), 1984. PhD in Computer Engineering in 1989 from Politecnico di Milano. Master in Neuro-Linguistic Programming in 1993, from IIPNL.

Full professor and Chair of the PhD Program in Information Technology at Politecnico di Milano, Department of Electronics, Information and Bioengineering.

Since 1990 he is coordinating the AI and Robotics Lab at Politecnico di Milano (AIRLab).

He has been nominated Fellow of the Alta Scuola Politecnica (<http://www.asp-poli.it>) in 2012. He is among the founders of the Italian Association for Artificial Intelligence (AI\*IA) and the Italian Regional Interest Group of the IEEE Neural Network Council, now Italian Chapter of the IEEE Computational Intelligence Society (Chair from 2008 to 2010). He has been from 2003 to 2006 coordinator of the Working Group on Robotics of the AI\*IA. He participated since 1997 to the Robocup initiative (member of the Executive Committee from 2002 to 2010 ([www.robocup.org](http://www.robocup.org))).

He is currently in charge of "Informatics", "Artificial Intelligence", "Robotics and Design", and "Soft Computing" courses at the Politecnico di Milano. He has given and gives courses about "Uncertainty", "Fuzzy Logic", "Soft Computing" and "Designing Interaction" within the PhD Program of Politecnico. He has tutored more than 150 Laurea (Master) Theses, some ERASMUS Theses, Alta Scuola Politecnica theses, and 12 PhD Theses in the AI, Machine Learning, and Robotics fields.

He has participated and led several EU, national, and industrial projects. Since 1989, he has realized with his collaborators and students more than 40 autonomous robots. His research interests are focusing on Human-Robot Interaction, but still include Intelligent Data Interpretation, Autonomous Robotic Agents (in particular for Edutainment, Entertainment, and Robogames), Affective Computing, Reinforcement Learning, and Fuzzy Systems. He has published more than 150 peer-reviewed papers on international journals, books, and proceedings of international congresses.

In 2015, he co-founded the Novalabs start-up ([www.novalabs.io](http://www.novalabs.io)), a company based on the results of research developed with PhD students in collaboration with ST Microelectronics, i.e., a HW/SW system to provide modules to implement professional robots with a plug-and-play approach. This makes it possible to implement the electronics and basic control of professional, autonomous, mobile robots (and many other devices) in 1-2 days.

## Attachment A2 – PhD Faculty Board

Name	Affiliation	Scientific Disciplinary Sector
BONARINI ANDREA	DEIB	ING-INF/05
ALIPPI CESARE	DEIB	ING-INF/05
AMIGONI FRANCESCO	DEIB	ING-INF/05

BASCETTA LUCA	DEIB	ING-INF/04
BERTUCCIO GIUSEPPE	DEIB	ING-INF/01
BOLCHINI CRISTIANA	DEIB	ING-INF/05
BOLZERN PAOLO	DEIB	ING-INF/04
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
FIORINI CARLO	DEIB	ING-INF/01
GARATTI SIMONE	DEIB	ING-INF/04
GATTI NICOLA	DEIB	ING-INF/05
GERACI ANGELO	DEIB	ING-INF/01
MARTELLI PAOLO	DEIB	ING-INF/03
MIRANDOLA RAFFAELA	DEIB	ING-INF/05
MONTI GUARNIERI ANDREA	DEIB	ING-INF/03
PERNICI BARBARA	DEIB	ING-INF/05
PRADELLA MATTEO	DEIB	ING-INF/05
RECH IVAN	DEIB	ING-INF/01
RIVA CARLO	DEIB	ING-INF/03
SOTTOCORNOLA SPINELLI ALESSANDRO	DEIB	ING-INF/01
TANCA LETIZIA	DEIB	ING-INF/05
TORNATORE MASSIMO	DEIB	ING-INF/03

## Attachment A3 – PhD Advisory Board

Name	Affiliation
Paolo Amato	Micron
Claudio Bartolini	Cloud4Wi
Mario Caironi	IIT
Cristina Cremonesi	The European Ambrosetti
Riccardo De Gaudenzi	European Space Agency
Giuseppe Fogliazza	MCE Srl
Massimo Leoni	IBM
Renato Lombardi	Huawei
Renato Marchi	Grupo PAM
Massimo Valla	TIM
Luisa Venturini	Vodafone
Stefano Verzura	Huawei
Roberto Villa	IBM