PhD in Emerging Digital Technologies

http://www.santannapisa.it/en/education/international-phd-course-emerging-digital-technologies

Coordinator	Prof. Luca Valcarenghi e-mail phdtecip@santannapisa.it	
Language	English	
Duration	3 years	
Curricula	**Embedded Systems**	design and development of software for real-time embedded systems
	Photonic Technologies	photonic integrated circuits, sensors, photonic communications and telecommunications networks
	Perceptual Robotics	Human-robot interaction systems, telerobotics and virtual environments
Number of positions available	**8 positions with scholarship, funded by Scuola Superiore Sant'Anna,** of which: - **1** funded by **the Project Dipartimenti di Eccellenza** - **1** funded by **Rete Ferroviaria Italiana (RFI) within the project "Realizzazione di un kernel hard real-time per architetture ARM® ed Intel® e di un hypervisor per architetture Intel®"** At least 2 positions will be assigned to each of the aforementioned curricula. The one (1) position financed by the Project Dipartimenti di Eccellenza will be assigned considering also the relevance of the research plan to the Project Dipartimenti di Eccellenza topics. **PROJECT DIPARTIMENTI DI ECCELLENZA** The "Dipartimento di Eccellenza della Classe di Scienze Sperimentali e Applicate" deals with the study and the development of a new generation of connected robots that, by integrating the most recent developments in the Artificail Intelligence (AI) and Materials Science (MS) fields, can provide robots with augmented cognitive, sensorimotor, and physical capabilities. The research plans related to the "Dipartimento di Eccellenza della Classe di Scienze Sperimentali e Applicate" can broadly involve all the Ph.D. curricula, proposing research topics such as: • Artificial Intelligence systems, integration of algorithms in parallel computers, IoT techniques, machine learning, deep learning, and reinforcement learning algorithms, to develop cognitive capabilities in autonomous robots; • material physics/chemistry/technology for the development of novel sensors and actuators, specialised and miniaturized, and of multifunctional parts of machines and robots; • development of innovative robots for application in Life Sciences, Industry 4.0, and Cyber-Security.	

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The one (1) position funded by RFI will be assigned to the Embedded Systems curriculum also considering the relevance of the research project proposed by the candidate to the themes of the project funded by RFI.

RFI PROJECT
The project funded by RFI is part of a broader infrastructure planning of the Italian railway network concerning the replacement of the computing platforms currently used on trains and in stations with more modern platforms based on multi-processor heterogeneous architectures. The PhD position is aimed at researching innovative mechanisms at the operating system and hypervisor level to meet safety, real-time and fault tolerance requirements mandated by modern railway applications.

Furthermore, before the beginning of the Course, on the basis of specific agreements following positions may be activated:
- positions dedicated to specific industrial research activities, in partnership with organisations and private companies;
- positions intended for apprenticeship contracts, pursuant to article 11 of Italian Ministerial Decree no. 45/2013 and article 5 of Italian Legislative Decree 167/2011 (High-level Apprenticeship PhD);
- positions reserved for employees of companies which perform research and development activities, pursuant to article 11 of Italian Ministerial Decree no. 45/2013 (Industrial PhD).
- positions reserved to foreign recipients of scholarship.

PhD positions mentioned above are reserved for eligible candidates under the provision of a grant or a scholarship, from a public or private sponsor, at least equal to the three years Sant'Anna scholarship (including canteen services, periods out of office and external research activities).

Scholarship amount	**Euro 16.000,00** gross paid to payee in deferred monthly instalments The gross amount includes social security contributions payable by the recipient.
Requirements for taking part in the competition (in addition to those under article 2 of the competition notice)	Candidates shall possess specific skills, certified by examinations taken in Bachelor's and Master's programmes, as defined for each curriculum in the *"Sheet of the skills required for admission to the Phd in Emerging Digital Technologies"* attached below. The Assessment Board may admit candidates without some of the required skills to the PhD programme, appropriating debits which must be made up by the end of the first year of the programme.
Submission deadline for the online application	July 1st, 2019 (23:59 CEST)
Mandatory documentation under penalty of exclusion to be attached to the online application	Candidates should attach the following documents (all documents should be in pdf format with files named as specified below): 1. Passport_Surname_Name.pdf: copy of a valid identity document. Non-EU candidates are required to attach a copy of their passport; 2. Cv_Surname_Name.pdf: CV (in English or Italian), placing special emphasis on scientific training, professional experience, publications and any other information which can be used to assess the candidate; 3. Transcripts_Surname_Name.pdf: certificate (in English or Italian) of the exams passed in the Bachelor's and Master's programmes, specifying corresponding credits and the marks received for each of them; 4. Thesis_Surname_Name.pdf: copy of the MSc degree thesis (or an abstract of the thesis, with a photocopy of the cover page, in English or Italian), and of any

	other publication deemed useful for the assessment. Candidates who have not yet obtained the qualification should attach a copy of the degree thesis as a final draft to the application, or an abstract of the same; 5. **only for candidates who obtained their qualification abroad**: copy of the Master's Degree Certificate or equivalent qualification translated into Italian or English unless written in French, German or Spanish; 6. Research Project_Surname_Name: a detailed research plan in Italian or English of no more than 3000 words. It should be a three-year research plan including details of: • the title of the research; • the scientific premises and relevant bibliography; • the aim and expected results of the research project; • experimental and data analysis methodologies, where necessary. The research plan submitted is not binding for the definition of the research plan to be carried out as part of the Programme;
Additional, not mandatory, documentation	1. References_Surname_Name: up to two letters of reference (in English or Italian), written by university teaching staff who monitored the candidate's education during his/her university studies. Alternatively, the teaching staff may email letters of reference to phdtecip@santannapisa.it, by the deadline of the competition announcement, specifying "Candidate's surname and name – reference letter" as the subject of the email. It is the candidate's duty to make sure that the letters of reference are sent by the specified deadline; 2. Other_Surname_Name: any other documents deemed useful for the assessment (for example, GRE certificates, certificates for course and internship attendance, etc.).
Test examinations	**Qualifications and interview** Selection consists in the assessment of the qualifications submitted and an interview. The Board will award a score out of one hundred, from 1 to 100. *Assessment of qualifications – maximum score possible: 70* The Examining Board will assess the CV of studies and any scientific qualifications submitted. The candidate's research plan will be assessed in terms of both quality and feasibility and relevance with respect to the lines of research specified in the "brief description" and "curricula" sections of this information sheet. Those candidates obtaining a score of at least 49/70 in the assessment of qualifications phase will be accepted for interview. The School will publish the list of candidates selected for interview and the relative schedule at: https://www.santannapisa.it/en/education/international-phd-course-emerging-digital-technologies **Candidates are not required to be present during the assessment of qualifications.** *Interview – maximum score possible: 30* The interview will consist in a discussion about the qualifications submitted, in particular the CV, and about the proposed research topics, as well as verification of the level of knowledge of the English language. Candidates obtaining a score below 21/30 in the interview will be excluded from the merit ranking list. The interviews will take place on the premises of the School, in the city of Pisa. In special cases, to be subjected to the opinion of the Board, the interview may be conducted as a video conference (for example using the software Skype). In this case,

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the candidate shall specify this choice in the application to take part in the competition, attaching a copy of his/her identity document which should include a clear photograph. The identity document used in the online form should be shown before the start of the test in order to enable identification of the candidate. Candidates should be prepared to conduct the interview throughout the whole day scheduled in the selection schedule, until their respective interviews take place. In the event of failure or problems with the connection, the Examining Board may decide to postpone the interview to another time, included within the test schedule. It is in any case the candidate's responsibility to make sure that required hardware (PC, webcam) and software are available and that there is a reliable internet connection.

The minimum score for being added to the general merit ranking list is 70/100.

The School will notify only successful candidates of their admission to the School, using the email address given in the application; the said candidates will be required to confirm their acceptance by responding within 7 days, on pain of forfeiture and awarding of the position to the first suitable candidate on the ranking list.

If positions are left empty in one of the curricula making up the Programme, the relative scholarships may be assigned to other curricula, according to the ranking list.

Test schedule	The list of the candidates selected for interview will be published at: https://www.santannapisa.it/en/education/international-phd-course-emerging-digital-technologies Interviews dates will be published at: https://www.santannapisa.it/en/education/international-phd-course-emerging-digital-technologies The general merit ranking list will be published at: https://www.santannapisa.it/en/education/international-phd-course-emerging-digital-technologies
Information	phdtecip@santannapisa.it tel. +39.050.882095

SHEET OF THE SKILLS REQUIRED FOR ADMISSION TO THE PHD IN EMERGING DIGITAL TECHNOLOGIES

Skills required for the Embedded Systems curriculum:

Basic Calculus
Fundamentals of Physics
Fundamentals of Computer Programming
Computer Architectures
Fundamentals of Digital Circuits
Automatic Control
Operating Systems

Skills required for the Photonic Technologies curriculum:

Profile A – Communication systems and devices	Profile B – Photonic Networks and control
Advanced Calculus	Advanced Calculus
Fundamentals of Physics	Fundamentals of Physics
Digital Communication Theory	Digital Communication Theory
Fundamentals of Optical Communications	Fundamentals of Optical Communications
Fundamentals of Optoelectronics	Computer Networks
Electromagnetic Fields and Propagation	Fundamentals of Computer Science
Fundamentals of Computer Programming	Fundamentals of Computer Programming

Skills required for the Perceptual Robotics curriculum:

Profile A – Virtual Environments	Profile B – Automation
Elements of Algebra and Analysis	Elements of Algebra and Analysis
Elements of Physics	Elements of Physics
Geometry	Signal Theory
Elements of Computer Programming	Theory of Dynamic Systems
Computer Architectures	Automation and Control
Operating Systems	Robotics
Profile C – Mechanics	Profile D – Perception
Elements of Algebra and Analysis	Elements of Algebra and Analysis
Elements of Physics	Fundamentals of Physics
Fundamentals of Applied Mechanics	Fundamentals of Computer Science
Fundamentals of Machine Design	Fundamentals of Computer Programming
Dynamics & Control	Dynamics & Control
Robotics	Robotics

Profile E - Mechatronics
Elements of Algebra and Analysis
Elements of Physics
Mechatronics
Fundamentals of Electronics
Measurement and Data Analysis
Elements of Artificial Intelligence