**Ph.D. in Emerging Digital Technologies**

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

| | | |
|---|---|---|
| **Coordinator** | Prof. Luca Valcarenghi<br>e-mail info-phdtecip@santannapisa.it | |
| **Language** | English | |
| **Duration** | 3 years | |
| **Curricula** | **Embedded Systems** | It focuses on real-time embedded software for safe and secure cyber-physical systems, hardware acceleration of deep neural networks, operating systems, cloud computing, hypervisors, software architectures for a predictable support of machine learning algorithms in safety-critical systems, as autonomous driving and artificial intelligence for industrial systems. |
| | **Photonic Technologies** | It focuses on photonic integrated circuits and sensors, optical communication systems and networks, microwave photonics for 5G/6G, photonics for radar and lidar, optical wireless, artificial intelligence in telecommunication networks, programmable telecommunication networks. Applications span terrestrial, aerial, and space domains. |
| | **Perceptual Robotics** | It focuses on human-robot interaction systems, telerobotics and virtual environments, intelligent automation systems and artificial intelligence, mechanical engineering and intelligent machine design, human-robot interaction, and wearable robotics, virtual and augmented. |

| | |
|---|---|
| **Number of available positions** | **n. 3 positions with scholarship, funded by Scuola Superiore Sant'Anna**<br><br>**n. 2 positions with "PNRR Ph.D. Scholarships" funded by the European Union – NextGenerationEU**, under the National Recovery and Resilience Plan (**NRRP**), Mission 4, Component 1, Investment 4.1, in compliance with Ministerial Decree n. 118/2023, and focusing on areas of interest of the PNRR.<br><br>**n. 2 positions with "Digital and Green Transition Ph.D. Scholarships" funded by the European Union – NextGenerationEU**, under the National Recovery and Resilience Plan (**NRRP**), Mission 4, Component 1, Investment 3.4, in compliance with Ministerial Decree n. 118/2023 and focusing on subject areas and disciplines consistent with the digital transformation and green transition referred to in the PNRR.<br><br>At least 2 positions will be assigned to each of the aforementioned curricula.<br><br>**n. 6 further positions with scholarship funded by the European Union – NextGenerationEU, in the framework of Mission 4, Component 2, Investment 1.3 of the National Recovery and Resilience Plan (NRRP): Project "RESearch and innovation on future Telecommunications systems and networks, to make Italy more smART (RESTART)", code PE00000001 – CUP B83D22001190006**<br>**of which:**<br>• **5 within the Photonic Technologies curriculum**, to carry out research activities in the following topics with respect to which the relevance of the research project presented will be assessed:<br>• 2 scholarships on integrated photonics for telecommunications<br>• 1 scholarship on wireless optical systems<br>• 1 scholarship on theory and techniques for optical fiber communications<br>• 1 scholarship on network softwarization<br>• **1 within the Perceptual Robotics curriculum**, dedicated to carrying out research activities in the field of the topic:<br>• 1 scholarship on telepresence systems and infrastructures for medical applications<br><br>**n. 1 futher position, within the curriculum Perceptual Robotics, with "NRRP Ph.D. Scholarship" funded by the European Union – NextGenerationEU, National Recovery and Resilience Plan (NRRP) Mission 4, Component 2, Investment 3.3, in compliance with Ministerial Decree n. 117/2023**, "Introduction of innovative doctorates that respond to the innovation needs of businesses and promote the recruitment of researchers from businesses" co-funded by Wearable Robotics srl,- and focusing on the research theme "Design and development of control systems for robotic exoskeletons"<br><br>Finanziato dall'Unione europea NextGenerationEU · Ministero dell'Università e della Ricerca · Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA<br><br>**n. 1 further position with scholarship "Prof. Marco Di Natale" on one of the following themes:**<br>• Real-time systems<br>• Design optimization of embedded systems<br>• Software for automotive systems |

| | |
|---|---|
| **Scholarship amount** | **Euro 18,800.00** gross beneficiary paid in deferred monthly instalments. From such amount social security charges to be paid by the beneficiary are to be deducted. In addition, students can take advantage: <br>• 26 free monthly meals at the school canteen excluding academic holiday periods, <br>• an increase of € 4.700 gross beneficiary for the period of study and research abroad, subject to the authorization of the Faculty Board, <br>• a budget of € 5.640 to be allocated to cover expenses related to the research activity, <br>• an additional contribution of € 2,200/year as reimbursement for accommodation costs to be paid based on Equivalent Economic Status Index (ISEE). |
| **Requirements for participating to 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 Ph.D. programme, assigning debits which must be made up by the end of the first year of the programme. |
| **Online application submission deadline** | **May 31st, 2023 (12:00 CEST)** |
| **Mandatory documentation 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): <br>1. Passport_Surname_Name.pdf: copy of a valid identity document. Non-EU candidates are required to attach a copy of their passport; <br>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; <br>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; <br>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 or an abstract of it to the application; <br>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; <br>6. Research Project_Surname_Name: a detailed research plan in Italian or English of no more than 3000 words (strictly enforced). It should be a three-year research plan including details of: <br>    • the title of the research; <br>    • the scientific premises and relevant bibliography; <br>    • the aim and expected results of the research project; <br>    • experimental and data analysis methodologies, where necessary. <br>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. The letters of reference shall be uploaded till three days after the deadline of the competition;<br>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**<br>Selection consists of the assessment of the submitted qualifications and an interview.<br>The Board will award a score out of one hundred, from 1 to 100.<br><br>*Assessment of qualifications – maximum possible score: 70*<br>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.<br>The School will publish the list of candidates selected for interview and the relative schedule at:<br>https://www.santannapisa.it/en/education/international-phd-course-emerging-digital-technologies<br><br>**Candidates are not required to be present during the assessment of qualifications.**<br><br>*Interview – maximum possible score: 30*<br>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.<br><br>Candidates obtaining a score below 21/30 in the interview will be excluded from the merit ranking list.<br><br>The interviews will take place on the premises of the School, in the city of Pisa.<br>In special cases, due also to the current COVID-19 pandemic, subject to the opinion of the Board, the interview may be conducted as a video conference through the platforms available at the School. In this case, 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 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.<br><br>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 within the curriculum.<br><br>If positions are left empty in one of the curricula included in 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 the interview, the interview dates, and the general merit ranking list will be published at:<br><br>https://www.santannapisa.it/en/training/call-admission-phd-emerging-digital-technologies-2023-24 |
| **Information** | e-mail info-phdtecip@santannapisa.it<br>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 |
| Fundamentals of System Theory |
| Operating Systems |

Skills required for the Photonic Technologies curriculum:

| Profilo A – Optical Communication systems and photonic devices (check 4 out 7) | Profilo B – Optical Networks (check 4 out of 7) |
| --- | --- |
| 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 | Fundamentals of Computer Science |
| Fundamentals of Computer Programming | Fundamentals of Computer Programming |

Skills required for the Perceptual Robotics curriculum:

| Profile A – Industrial | Profile B – Informatics |
| --- | --- |
| **Common requirements:** | **Common requirements:** |
| Elements of Algebra and Analysis | Elements of Algebra and Analysis |
| Elements of Physics | Elements of Physics |
| Fundamental of Robotics | Elements of Computer Programming |
| | |
| | |
| **Check 3 out of 5 from:** | **Check 3 out of 5 from:** |
| Automation and Control | Computer Architectures |
| Fundamentals of Applied Mechanics | Theory of Dynamic Systems |
| Fundamentals of Machine Design | Fundamentals of Operating Systems |
| Fundamental of Electronics or Mechatronics | Signal Theory |
| Measurement and Data Analysis | Fundamentals of Artificial Intelligence |