TABLE 3 – PhD Programme in INDUSTRIAL AND INFORMATION ENGINEERING

THE PHD PROGRAMME	
Administrative location	University of Udine, Polytechnic Department of Engineering and Architecture (DPIA) - via delle Scienze 206, 33100 Udine, ITALY (tel. +39 0432 558253)
Partner institution	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the location of the administrative programme or in other locations of the University of Udine. The research programme will be carried out, with reference to the scholarship (see art. 10 and 13 of the Call) and/or to the supervisor assigned, at one of these locations: administrative location, partner location, financial supporter location (if the financial supporter is an external institution).
Coordinator	prof. Andrea Fusiello (andrea.fusiello@uniud.it)
Programme duration	3 years
Curricula	1. New management paradigms and fabrication technologies 2. Information and communication technology for the inclusive society for competitive enterprises with low environmental impact 3. Design of innovative thermo-electro-mechanical systems and development of advanced methods for the assessment of structural damage and reliability for energy saving 4. Mechanical technologies and electronic devices for domotics, medical diagnostic and safety
Research Topics	- *Curriculum 1 - New management paradigms and fabrication technologies for competitive enterprises with low environmental impact* 1. Lean management, agile project management, operations management, production planning and control, supply chain management, purchasing and supplier management, innovation management, new product development, global manufacturing, complexity management, performance measurement systems; 2. System and machinery efficiency for industrial production; 3. Cognitive features of products development in view of CAD-PLM technologies; 4. Characteristics and applicability of emerging prototyping methodologies (augmented reality, functional mock-up, interaction design, etc.); 5. Smart logistics: computation models and algorithms; 6. New technologies for the manufacturing of innovative materials; 7. Systems for monitoring and control of machine tools; 8. Methodologies for the design of automatic systems with a high energy and production efficiency. Approaches to system and product innovation; 9. Robotic systems for the industrial sustainability; 10. Robotic systems for production and energy efficiency. - *Curriculum 2 - Information and communication technology for the inclusive society* 1. Nano-electronic devices (MOSFETs, Steep Slope, etc.) for energy efficient and high-performance electronics. Non-volatile Memories for massive 3D integration (Flash, charge trap); 2. Advanced electron devices based on innovative materials and architectures in the Beyond CMOS and More than Moore domains: graphene, 2D crystals, III-V compound semiconductor devices; 3. Semi-classical (BTE) and quantum mechanical (NEGF) simulation of nanoelectronics devices; 4. Integrated circuit design for energy efficient communications, energy conversion and management; 5. Innovative communication paradigms and systems: systems with multiple antennae, distributed communication systems, HW and SW architectures for telecommunications; 6. Multimedia signals processing and analysis: video and image encoding, video streaming based on peer-to-peer networks, joint source/channel encoding, compressive sensing; 7. Test and development of metaheuristic algorithms for combinatorial problems: 8. Pervasive computing, cloud computing, overlay networking, distributed computing in miscellaneous networks of computers; 9. Artificial vision system, virtual sound, machine learning; 10. Wireless communication systems and networks, signal processing for communication, physical substrate algorithms, transmission system algorithms.

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	11. Data and Information Fusion. *Curriculum 3 – Design of innovative thermo-electro-mechanical systems and development of advanced methods for the assessment of structural damage and reliability for energy saving* 1. Energy harvesting systems for self powered, smart, distributed sensors; 2. Electro-mechanical devices for innovative production and storage energy systems; 3. New paradigms, systems, technologies for surface and air transportation vehicles with low energy consumption; 4. Improving the performance and energy efficiency of industrial systems through innovative power electronic converters, machines and electric drives; 5. Power electronic converters, electrical machines and drives for electric power generation and distribution, and electric mobility of the future; 6. On board electronics: terrestrial and satellite localisation and navigation systems; communication networks and systems; 7. Green mechatronics: mechatronics for energy saving; 8. Design methodologies for materials handling systems characterised by low environmental impact; 9. Holistic design of lightweight structures for low emissions and low energy consumption vehicles; 10. Design of energy efficiency industrial plants; 11. Stress and strain analysis of materials and structures subjected to time-dependant deformation processes; 12. Methods for structural integrity design and verification; 13. Developments of damage-tolerant design methods; 14. Multi-physics analyses for the evaluation of the stress/strain state in materials and engineering structures; 15. Micromechanical damaging processes in materials; 16. Behaviour characterisation and modelling of materials processed by advanced manufacturing techniques; 17. Modeling and control of mechanical and mechatronic systems; 18. Modeling and control of vibrations in mechanical systems; 19. Numerical modeling for the simulation of electromagnetic devices and fields. - *Curriculum 4 – Mechanical technologies and electronic devices for domotics, medical diagnostic and safety* 1. Smart systems and technologies for home, working and leisure environments 2. Systems for safety at work, on the road, at home; systems for the management of home assistance activities; 3. Sensors, devices and instrumentation for medical care and tests and for the support of the elderly; systems for the planning and support of hospital activities; 4. Innovative paradigms for the interaction of domotics, surgery and security devices; 5. Passive and active control of noise and vibration for industrial, home and surface-air transport vehicles applications; 6. Devices and instrumentation for the detection of biomedical parameters: nanosensors 7. Robots for eldery and disable people assistance; 8. Robots for surgery applications; 9. Large scale tri-dimensional image modelling, automatic synthesis of binocular video flows from monocular sources; 10. Geophysics; seismic data acquisition, vulcanology, geostatics, seismic risk evaluation.
Research programmes	The research programmes, if not already defined by funding organizations or specific funding lines (see “Available places and assessment procedures”, art. 3 p. 5 of the Call), are determined by the Board of Professors within the doctoral programme Research topics.
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-physical-science-and-engineering/industrial-and-information-engineering/ph-d-programme/industrial-and-information-engineering?set_language=en https://phd.diegm.uniud.it/iie-phd/

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ADMISSION REQUIREMENTS	
Required Degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and DM 270/04) or equivalent degree obtained abroad. Foreign degrees and diplomas: refer to art. 4 of the Call.
Knowledge of the foreign languages	English

SELECTION COMMITTEE	
Regular members	Pier Luca Montessoro – full professor – University of Udine Denis Benasciutti – full professor – University of Udine Marco Giuseppe Pala – associate professor – University of Udine
Substitute members	David Esseni – full professor – University of Udine Paolo Gardonio – full professor – University of Udine Andrea Fusiello – full professor – University of Udine

ADMISSION

Selection process	
Evaluation of qualifications and documents; oral exam. The evaluation aims to assess the candidates' ability to conduct scientific research and their basic preparation for the doctoral programme. The Selection Committee can attribute up to 100 points to each applicant: max 30 points to the documents and max 70 points to the oral exam. Candidates who score **at least 16/30** points in the **evaluation of qualifications and documents** are admitted to the oral exam**.** Candidates must attain a score of at least **49/70** points on the oral exam to be eligible. For eligible candidates only, the score from the evaluation of documents is added to the score obtained in the oral exam.	
Language that can be used for exam	**Italian or English**
Oral exam	**The oral exam is taken remotely.** The oral exam consists in a test of about 15 minutes aiming to assess the applicant flair to undertake a research doctorate and to carry out the research tasks in the areas of interest for the doctorate. The oral exam will be assessed considering the following criteria: a) technical and scientific competence in the topics of the doctorate; b) knowledge of the state of the art for the doctorate curricula; c) mastery of English.

QUALIFICATIONS SUBJECT TO EVALUATION AND DOCUMENTS TO BE SUBMITTED			Maximum score
<u>Mandatory</u> documents (art. 5 of the Call) UNDER PENALTY OF EXCLUSION	**1**	DOCUMENTS REQUIRED FOR ADMISSION TO THE PHD PROGRAMME (Art. 4 of the Call for Applications): **Italian or EU candidates holding:** • **Degree already obtained:** Self-certification issued in the form of a substitute declaration pursuant to Art. 46 and 47 of Presidential Decree no. 445 of 28.12.2000 and subsequent amendments, certifying the degree obtained and its related details (University, final grade, date of issue). *A template is available for download on the webpage dedicated to doctoral programmes.* • **Degree to be obtained:** Self-certification issued in the form of a substitute declaration pursuant to Art. 46 and 47 of Presidential Decree no. 445 of 28.12.2000 and subsequent amendments, certifying enrollment in the degree programme and its related details (University, average exam marks, credits earned, expected date when degree will be issued). *A template is available for download on the webpage dedicated to doctoral programmes.* **Non-EU candidates who are not legally residing in Italy and not authorized to stay in the country, in possession of:** • **Foreign degree already obtained:** – Certificate attesting the possession of a second-level university degree (see Art. 4), issued by the institution that awarded it, specifying the type of degree, date of issue and final grade;	

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		– Transcript of records of the Master's degree required for admission to the docotral programme, including credits (if provided for in the university system of the country that issued the degree), grades and grading scale. If the university system is divided into first and second cycle, it is preferable that applicants also submit their Bachelor's degree certificate (first-cycle degree) and the transcript of records for this. **• Foreign degree to be obtained:** Certificate of enrollment in a degree programme that qualifies for admission to the doctoral programme (see Art. 4), indicating exams taken, related credits (if provided for in the university system of the country that issued the degree), grades, grading scale (academic transcript of records) and the expected date of degree award. If the university system is structured in first and second cycle, applicants are also preferably required to submit the Bachelor's degree certificate (first-cycle degree) and the transcript of records for this. **Non-EU candidates who are legally residing in Italy, in possession of:** **• Degree already obtained in Italy:** Self-certification issued in the form of a substitute declaration pursuant to Art. 46 and 47 of Presidential Decree no. 445 of 28.12.2000 and subsequent amendments, certifying the degree obtained and its related details (University, final grade, date of issue). *A template is available for download on the webpage dedicated to doctoral programmes.* **• Degree to be obtained in Italy:** Self-certification issued in the form of a substitute declaration pursuant to Art. 46 and 47 of Presidential Decree no. 445 of 28.12.2000 and subsequent amendments, certifying enrollment in the degree programme and its related details (University, average exam marks, credits earned, expected date when degree will be issued). *A template is available for download on the webpage dedicated to doctoral programmes.* **Non-EU candidates legally residing in Italy, holding a degree obtained or to be obtained abroad, must follow the instructions for "non-EU candidates who are not legally residing in Italy and not authorized to stay in the country".** **Non-EU candidates authorized to reside in Italy may use self-certifications where the use of such documents is permitted under international agreements between Italy and the candidate's country of origin.** **Non-EU candidates legally residing in Italy and non-EU citizens authorized to reside in Italy who intend to use self-certifications must attach their residence permit or authorization to stay in Italy to their application.**	
	2	Copy of a valid **personal identification document** (for citizens of countries outside the European Union, a copy of the passport, specifically the pages showing the document number, photograph, personal details, place and date of issue, and expiration date).	
	3	**CV and Academic Record** which must provide detailed information on all previous and, where applicable, ongoing education and training (education and training history, degree thesis, publications and articles, research areas of interest, work experience, internships, research periods abroad, awards and honors, personal, social, organizational, technical, and artistic skills and competencies). *A template is available for download on the webpage dedicated to doctoral programmes.*	**16**
<u>Optional</u> documents (art. 5 of the Call)	**1**	**Master's Thesis** for the degree granting access to the doctoral programme. Candidates who, on the date of the call deadline, have not yet obtained this degree, must submit an extended abstract in Italian or English signed by their supervisor (25,000 characters, including spaces).	**2**
	2	**Publications** (upload max. 2 publications) relevant to the subjects of the doctoral programme.	**5**
	3	**Statement of purpose** by which the applicant explains the reasons for admission to the doctoral programme (approximate limit: 2,500 characters, including spaces).	**3**
	4	**Reference letters** (enter a max. of 2 reference contacts) from university professors, scientific researchers or other experts in the field (art. 6 of the Call).	**4**

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For details on the procedures for submitting documents and qualifications, please refer to Articles 5 and 6 of the Call.
In particular, it should be noted that:

1. Documents and qualifications must be submitted in Italian or English, except for those for which this form specifically requires English. Documents and qualifications originally in another language must be accompanied by a translation into Italian or English carried out by the candidate who assumes full responsibility for its accuracy. Regarding the thesis specifically, the translation may be limited to an extended abstract.
2. Documents and qualifications, with the exception of reference letters, must be attached to the online application in digital format (.pdf).