

**PHD COURSE IN "Information Technologies for Engineering"**

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Candidates are invited to contact the coordinator for information on curricula and subject areas

<b>DEPARTMENT</b>	Department of Engineering
<b>DURATION</b>	Triennial
<b>CURRICULUM AND ESSAY</b>	a) Information Technologies b) Energy and Environment
<b>Subject areas of the doctorate:</b>	01/A - MATHEMATICS 08/A - INFRASTRUCTURE AND LAND USE ENGINEERING 08/B - STRUCTURAL AND GEOTECHNICAL ENGINEERING 09/C - ENERGY, THERMO-MECHANICAL AND NUCLEAR ENGINEERING 09/D - CHEMICAL AND MATERIALS ENGINEERING 09/E - ELECTRICAL, ELECTRONIC AND MEASUREMENT ENGINEERING 09/F - TELECOMMUNICATIONS ENGINEERING AND ELECTROMAGNETIC FIELDS 09/G - SYSTEMS ENGINEERING AND BIOENGINEERING 09/H - COMPUTER ENGINEERING 09/E - ELECTRICAL, ELECTRONIC AND MEASUREMENT ENGINEERING

## PLACES IN COMPETITION (10 - Ten)

<p>Position with scholarship funded by Public Notice</p> <p>Campania Region:</p> <p><b>"INNOVATIVE RESEARCH DOCTORATES WITH INDUSTRIAL CHARACTERIZATION" PR CAMPANIA ESF+ 2021/2027- PRIORITY 2 EDUCATION AND TRAINING – SPECIFIC OBJECTIVE ESO 4.7 - ACTION 2.G.4. - D.D. N.100 OF 30.05.2025</b></p>	<p><b>“New Lab-On-Fiber Platforms for High-Performance Dosimetry in Interventional Radiotherapy”.</b></p> <p><b>Abstract (Eng)</b> The project aims to develop an innovative fiber-optic dosimetry platform capable of measuring the radiation dose administered during high-dose interventional radiotherapy procedures in real time and with improved precision and spatial resolution compared to currently available dosimeters. Interventional radiotherapy, also known as brachytherapy, is a technique for the curative treatment of cancer, particularly gynaecological tumors such as cervical, endometrial, vaginal and vulvar cancers in women and prostate cancer in men. The key element of the platform we aim to develop lies in the combination of fiber optics and modern nanotechnologies, aimed at developing miniaturized optical devices that can be integrated into medical needles and catheters and can monitor chemical and physical parameters directly in the patient's body using minimally invasive methods. This platform will be the key enabling technology for the creation of a radically new system, based on the integration of multiple fiber- optic dosimeters in a single medical needle (in different positions along the needle axis) and on the use of multiple needles, each composed of multiple dosimeters, allowing a highly accurate 4D reconstruction (x, y, z and time) of the dose delivered in or near the tumor and neighbouring organs at risk.</p>	<p><b>1 position</b></p>	<p>To participate in this type of position, it is mandatory to carry out periods of study and research abroad and in companies</p> <p><a href="https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/">https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/</a></p>
<p>Position with scholarship funded by Public Notice</p> <p>Campania Region:</p> <p><b>"INNOVATIVE RESEARCH DOCTORATES WITH INDUSTRIAL CHARACTERIZATION" PR CAMPANIA ESF+ 2021/2027- PRIORITY 2 EDUCATION AND TRAINING – SPECIFIC OBJECTIVE ESO 4.7 - ACTION 2.G.4. - D.D. N.100 OF 30.05.2025</b></p>	<p><b>Title (English): PRIVAI - PRotection and Verification of pre-trained models with Advanced techniques.</b></p> <p><b>Abstract (Eng):</b> The research project proposes to address the challenges related to the security and privacy of systems that integrate pre-trained artificial intelligence models, which are increasingly widespread in sectors such as healthcare, finance, and manufacturing. These models, due to their ability to generalize and adapt through techniques such as fine-tuning and Retrieval-Augmented Generation (RAG), serve as powerful tools but are also increasingly vulnerable to risks like targeted attacks, privacy breaches, and output manipulation. The main goal is to develop innovative methods that ensure end-to-end reliability, transparency, and security, thereby strengthening the entire ecosystem of interactions among data, models, and external sources. Specifically, the research proposes to define and formalize approaches for detecting and continuously monitoring bias and privacy violations, with the aim of implementing defense strategies enabling the sanitization of inputs and outputs against both active and passive threats</p>	<p><b>1 position</b></p>	<p>To participate in this type of position, it is mandatory to carry out periods of study and research abroad and in companies</p> <p><a href="https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/">https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/</a></p>
<p>Position with scholarship funded by Public Notice</p> <p>Campania Region:</p> <p><b>"INNOVATIVE RESEARCH</b></p>	<p><b>Development of new fuel systems with hydrogen for Gas Turbines used in the aviation sector for Urban Air Mobility (UAM) aircraft.</b></p>	<p><b>1 position</b></p>	<p>To participate in this type of position, it is mandatory to</p>

<p><b>DOCTORATES WITH INDUSTRIAL CHARACTERIZATION" PR CAMPANIA ESF+ 2021/2027- PRIORITY 2 EDUCATION AND TRAINING – SPECIFIC OBJECTIVE ESO 4.7 - ACTION 2.G.4. - D.D. N.100 OF 30.05.2025</b></p>	<p><b>Abstract (ENG):</b> In alignment with sustainability objectives, the aviation industry is facing a critical transition that includes the adoption of fuels like hydrogen. However, this transition requires overcoming significant challenges related to its production, storage, and combustion.</p> <p>This research project focuses on developing fuel systems for a gas turbine powered by increasing hydrogen/methane blends, specifically for Urban Air Mobility (UAM), a key future application. The primary challenge is the complete redesign of the fuel system due to hydrogen's unique properties: it heats upon expansion and must be stored under extreme conditions (cryogenic or high pressure), which impacts both weight and space. The core innovation of this project lies in the comprehensive design of a fuel system for hydrogen, including tanks, fuel control valves, and injectors. The project will involve numerical modelling (lumped parameter and 3D CFD) and experimental characterization, which will be conducted in close collaboration with corporate and international academic partners.</p>		<p>carry out periods of study and research abroad and in companies</p> <p><a href="https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/">https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/</a></p>
<p><b>Position with scholarship funded by Public Notice Campania Region: "INNOVATIVE RESEARCH DOCTORATES WITH INDUSTRIAL CHARACTERIZATION" PR CAMPANIA ESF+ 2021/2027- PRIORITY 2 EDUCATION AND TRAINING – SPECIFIC OBJECTIVE ESO 4.7 - ACTION 2.G.4. - D.D. N.100 OF 30.05.2025</b></p>	<p><b>Experimental analysis and numerical modelling of biofuels-from-biomass thermochemical processes.</b></p> <p><b>Abstract (ENG):</b> The proposal aims to evaluate, using Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) approaches, the techno-economic and environmental performances of thermochemical processes for the valorisation of lignocellulosic biomass, with a focus on gasification/pyrolysis and anaerobic digestion. The activity will be structured in a preliminary phase targeting to identify the primary residual biomasses available in the Campania region and to carry out their chemical–physical characterisation, followed by an experimental/modelling phase on anaerobic digestion and gasification/pyrolysis. This phase aims to identify the optimal operating parameters and model each specific process considered for the subsequent techno-economic and environmental assessments. A key element of this doctoral project will be a period of study and research at Babeş-Bolyai University in Cluj-Napoca (Romania) with Prof. Calin-Cristian Cormos. Based on the resulting data, an LCA and LCC analysis will then be carried out to provide an integrated evaluation of the proposed solutions’ technical, economic and environmental sustainability.</p>	<p><b>1 position</b></p>	<p>To participate in this type of position, it is mandatory to carry out periods of study and research abroad and in companies</p> <p><a href="https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/">https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazione-industriale/</a></p>
<p><b>Position with scholarship funded by Public Notice Campania Region: "INNOVATIVE RESEARCH DOCTORATES WITH INDUSTRIAL CHARACTERIZATION" PR CAMPANIA ESF+ 2021/2027- PRIORITY 2 EDUCATION AND TRAINING – SPECIFIC OBJECTIVE ESO 4.7 - ACTION 2.G.4. - D.D. N.100 OF 30.05.2025</b></p>	<p><b>DEVELOPMENT OF POINT-OF-CARE PLATFORMS FOR MASS SCREENING BASED ON ACTIVE OPTICAL FIBER PROBES</b></p> <p><b>Abstract (Eng):</b> The main objective of the project is to develop point-of-care diagnostic platforms based on fiber optic photonic sensors. The diagnostic platform is obtained by integrating active optoelectronic chips, such as quantum dot lasers and photodetectors, directly onto the tip of an optical fiber. These platforms, used in combination with plug-and-play microfluidic chips specifically designed to manipulate biological fluids taken from patients, create ultra-compact and completely autonomous point-of-care units capable of performing mass screening for viruses and tumor biomarkers in real time. The developed platforms will be tested in a clinical case of interest involving the detection of protoporphyrin IX, a biomarker of cerebral glioblastoma, in urine, serum, and plasma samples taken from patients.</p>	<p><b>1 position</b></p>	<p>To participate in this type of position, it is mandatory to carry out periods of study and research abroad and in companies</p> <p><a href="https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-">https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-</a></p>

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<p><b>Position with scholarship funded by Public Notice Campania Region: "INNOVATIVE PHDS WITH INDUSTRIAL CHARACTERIZATION" PR CAMPANIA ESF+ 2021/2027- PRIORITY 2 EDUCATION AND TRAINING - SPECIFIC OBJECTIVE ESO 4.7 - ACTION 2.G.4. - D.D. N.100 OF 30.05.2025.</b></p> <p>(the scholarship will be activated subject to authorization for funding by the Campania Region)</p>	<p><b>"Development of an integrated monitoring techniques for control and sustainable management of road and railway infrastructures".</b></p> <p><b>Abstract ENG:</b> The project aims to develop methodologies and models to objectively and accurately quantify the health, condition, and performance of road and rail infrastructure in real time. This goes beyond simple data collection, aiming for diagnostic and prognostic understanding. A key objective is the creation of predictive models to estimate the remaining useful life of infrastructure and predict its future condition. This forecasting capability represents new knowledge essential for long-term planning and proactive management. The integration of continuous, near-real-time data from various sources (sensors, drones, satellites) will significantly reduce uncertainty regarding the structural performance of infrastructure. This translates into more reliable and detailed knowledge. The research findings will contribute to the definition of new guidelines and best practices for infrastructure monitoring and management, influencing regulations and industry standards. The core of technological innovation lies in the "integrated" approach and process automation. The research will focus on the development of an automated SHM system capable of detecting damage to infrastructure and estimating its load-bearing capacity.</p>	<b>1 position</b>	<p>To participate in this type of position, it is mandatory to carry out periods of study and research abroad and in companies</p> <p><a href="https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazio-ne-industriale/">https://fse.regione.campania.it/dottorati-di-ricerca-innovativi-con-caratterizzazio-ne-industriale/</a></p>
<p><b>Position with scholarship funded by Engineering Ingegneria Informatica S.p.A</b></p>	<p><b>"An Orchestration Bill-of-Materials approach for the AI Cloud"</b></p> <p><b>Abstract:</b> The goal of this PhD is to define and develop approaches and tools for the definition and use of Orchestration Bill-of-Materials — or OBOM — understood as: "Machine-readable inventory of all topology elements, relationships, implementation artifacts, execution plans, and runtime links, including links to the SBOMs of the artifacts it instantiates."</p> <p>The minimum elements provided for in the definition above can be mapped almost one by one with those of a classic SBOM; however, real-time tracking, runtime management, adaptation and concrete use of OBOMs go far beyond the state of the art and can benefit significantly from the consolidated technologies around the current exploitation of SBOMs, e.g. Large Language Models (LLMs).</p>	<b>1 position</b>	
<p><b>Positions without scholarship</b></p>	<p><b>Topic related to the candidate's chosen curriculum</b></p>	<b>3 positions</b>	<p><b>Curriculum A</b> Information Technologies</p> <p><b>Curriculum B</b> Energy and Environment</p>

## Qualifications for access to the competition

<p><b>Qualifications for access to the competition</b></p>	<p>LM-4 Architecture and Building Engineering-ArchitectureLM-6 BiologyLM-7 Agricultural BiotechnologyLM-8 Industrial BiotechnologyLM-9 Medical, Veterinary and Pharmaceutical BiotechnologyLM-17 PhysicsLM-18 Computer ScienceLM-20 Aerospace and Astronautical EngineeringLM-21 Biomedical EngineeringLM-22 Chemical EngineeringLM-23 Civil EngineeringLM-24 Building Systems EngineeringLM-25 Automation EngineeringLM-26 Safety EngineeringLM-27 Telecommunications EngineeringLM-28 Electrical EngineeringLM-29 Electronic EngineeringLM-30 Energy and Nuclear EngineeringLM-31 Management EngineeringLM-32 Computer EngineeringLM-33 Mechanical EngineeringLM-34 Naval EngineeringLM-35 Environmental and Land EngineeringLM-40 MathematicsLM-44 Mathematical-Physical Modelling for EngineeringLM-53 Materials Science and EngineeringLM-54 Chemical SciencesLM-66 Computer SecurityLM-91 Techniques and Methods for the Information Society4/S (Master's Degree in Architecture and Building Engineering)20/S (master's degree in physics)23/S (master's degree in computer science)25/S (master's degree in aerospace and astronautical engineering)26/S (master's degree in biomedical engineering)27/S (master's degree in chemical engineering)28/S (master's degree in civil engineering)29/S (master's degree in automation engineering)30/S (master's degree in telecommunications engineering)31/S (master's degree in electrical engineering)32/S (master's degree in electronic engineering)33/S (master's degree in engineering Energy and Nuclear Engineering)34/S (Master's Degree in Management Engineering)35/S (Master's Degree in Computer Engineering)36/S (Master's Degree in Mechanical Engineering)37/S (Master's Degree in Naval Engineering)38/S (Master's Degree in Environmental and Land Engineering)45/S (Master's Degree in Mathematics)50/S (Master's Degree in Mathematical-Physical Modelling for Engineering)61/S (Master's Degree in Materials Science and Engineering)62/S (Master's Degree in Chemical Sciences)100/S (Master's Degree in Engineering techniques and methods for the information society)</p> <p><b>Degrees obtained according to the system prior to Ministerial Decree 509/99 equivalent to the qualifications indicated above are also considered admission qualifications</b></p> <p>Master degree or equivalent degree in Computer Science, Biomedical Engineering, Electrical Engineering, Computer Engineering, Software Engineering, Mechanical Engineering, Civil Engineering, Chemical Engineering, Energy Engineering, Aerospace Engineering, Mathematics, Physics, Material Science</p>
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## Procedures for conducting the competition tests

Procedures for conducting the competition tests	Qualifications, Curriculum and Interview		
	Evaluation of qualifications	Up to 40 points	<p>✓ Curriculum with certification of exams passed and score (up to 30 points);</p> <p>✓ Other (up to 10 points):</p> <ul style="list-style-type: none"> <li>○ Project;</li> <li>○ Motivation letter;</li> <li>○ Banns;</li> <li>○ Other training and/or research activities carried out</li> </ul> <p>Candidates who report a mark of not less than 24/40 in the evaluation of qualifications will be admitted to the oral test.</p>

	Interview	Up to 60 points	<p>The interview will last about 20 minutes.</p> <p>Candidates are invited to prepare a presentation of a research topic consistent with the chosen curriculum or topic, also using audiovisual means, lasting a maximum of 15 minutes. Candidates must prepare a presentation for each of the resumes/topics for which they have applied.</p> <p>Candidates who have obtained a mark of at least 36/60 in the interview will pass the oral test.</p> <p>Knowledge of the English language is assessed.</p> <p>The interview will take place by "<i>teleconference</i>".</p>
Diary of Competition Tests	Interview	The day and time of the interview will be announced with a notice published on the university website, at: <a href="http://www.unisannio.it/it/studente/laureato/dottorato-di-ricerca">http://www.unisannio.it/it/studente/laureato/dottorato-di-ricerca</a>	
Topic Competitive Tests	Short project proposal (1/2 pages) concerning the optioned theme. For candidates competing for positions without a scholarship, the project proposal may concern a free topic, as long as it is related to the S.S.D. contributing to the doctorate.		