PhD Programme table 37th cycle – PON Call for application "Ricerca e Innovazione" 2014 – 2020

PROGRAMME'S NAME	ELECTRONICS, TELECOMMUNICATIONS AND INFORMATION TECHNOLOGIES ENGINEERING
DURATION	3 years
PROGRAMME START DATE	01/01/2022
LANGUAGE	Italian, English
COORDINATOR	Prof. Alessandra Costanzo (alessandra.costanzo@unibo.it)
CURRICULA	N.A.
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	4
ADMISSION PROCEDURE	Qualifications and research proposal evaluation

Available Positions and Scholarships

Actions	Pos. n.	Financial Support	Research topic
Action IV.5 "PhDs on green topics"	1	PhD Scholarship	High performance and energy efficient devices, circuits, and architectures for edge computing
	2	PhD Scholarship	Devices, circuits, and components for high-efficiency wireless systems
	3	PhD Scholarship	Sustainable Communication Technologies for a Greener Future
	4	PhD Scholarship	Greener B5G and 6G NTN through Virtualization and Softwarization

Required and Supporting Documents to be attached to the application

(only documents in Italian, English, French, German and Spanish shall be considered as valid and be assessed by the Admission Board)
Only qualifications obtained during the last 5 calendar years shall be taken into consideration, except for the University Degree. **The Admission Board will assess the relevance of the supporting documents to the criteria listed in Art. 3 of the Ministerial Decree 1061/2021 (see also Art. 4 of the Call for applications)**.

REQUIRED DOCUMENTS	
Identity document	Valid identity document with photo (i.e. identity card, passport)
Curriculum Vitae	No specific CV format is required
Degrees	Documents attesting the awarding of the first and second cycle degrees (see Art. 3 of the Call for Applications)
Research proposal	Multi-annual research proposal, with special emphasis on the activities to be completed during the first-year course. The proposal must meet the following requirements: - it **cannot exceed 20.000 characters**, including spaces and formulas, if present. This figure does not include: the title, the outline, references and images (such as graphs, diagrams, tables etc. - where present);

	- it must be written following the template provided for Action IV.5 "PhDs on Green topics". The template is attached to the Call for Application and available for download on the University website.	
SUPPORTING DOCUMENTS		
Publications	Lists of publications (i.e. monographs, articles on scientific journals), minor publications (conference papers, etc.), abstracts and posters presented during national and international conferences, etc.	

Evaluation criteria

The **results of the admission exams** will be available **from 03/11/2021** on <u>Studenti Online</u> (select "summary of the requests in progress" > "see detail" and open the .pdf file at the bottom of the page). **No personal written communication will be sent to applicants concerning the examinations results**.

Scores will be expressed in points out of 100, as follows.

Minimum score for eligibility: 60 points, Maximum score: 100 points

Qualifications evaluation	Second cycle degree final mark. Graduands shall be evaluated according to the Weighted Average Mark	Max 10 points as follows: - 10 points for 110 and 110 *cum laude* - 9 points for 108 and 109 - 8 points for scores from 105 to 107 included - 6 points for scores from 101 to 104 included - 5 points for scores from 98 to 100 included - 4 points for scores from 95 to 97 included - 3 points for scores from 93 to 94 included
	Publications and other documents attesting the capabilities of the candidate	Max 10 points as follows (only publications and titles which are deemed relevant to the Research proposal will be considered): - 3 points for publications on ISI/Scopus or Class A journals; - 1 point for each publication in conference proceedings, participation to such conferences and other academic publications
Research proposal evaluation	Scientific value and innovative nature of the proposal	Max 20 points
	Potential of the research project in fostering exchanges between research and business	Max 20 points
	Individuation of parameters which allow measuring the project's progress	Max 20 points
	Adherence of the research goals to the objectives of the PNR 2021-2027	Max 20 points

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Research Topics

n. 1 - GREEN

Thematic area SNSI 2014-20	Digital Agenda, Smart Communities, Smart Mobility Systems Technological Development Trajectory: "Embedded" electronic systems, smart sensor networks, internet of things
PNR 2021-2027*	Thematic Area: 5.4 Digital, Industry, Aerospace; sub-theme: 5.4.1 Digital Transition and 4.0 Industry; articulation: 4 Heterogeneous Devices and Systems
Project title	High performance and energy efficient devices, circuits, and architectures for edge computing
Project description	Goal of the proposed research activity is to explore In-Memory Computing (IMC) as an enabling technology for the sustainable development of emerging services which require ultra-low-power and high-performance distributed computation. To this end, the project intends to investigate the potential of semiconductor memories for non-conventional tasks enabling ultra-low-power computing and Artificial Intelligence (AI) at the Edge. The research focus is on devices, circuits, and architectures design for IMC. Possible applications are smart agriculture and smart mobility.
Mandatory traineeship	6 months
Company type	Integrated Devices Manufacturing for Smart Driving, Industry, Home & City
Stay abroad	No

n. 2 - GREEN

Thematic area SNSI 2014-20	Digital Agenda, Smart Communities, Smart Mobility Systems Technological Development Trajectory: Technologies for dissemination of ultra-broadband connection and web economy
PNR 2021-2027*	Thematic Area: 5.4 Digital, Industry, Aerospace; sub-theme: 5.4.1 Digital Transition and 4.0 Industry; articulation: 4 Heterogeneous Devices and Systems Ambito tematico 5.4 DIGITALE, INDUSTRIA, AEROSPAZIO; 5.4.1 Transizione digitale – i4.0; Articolazione 4. Dispositivi e sistemi eterogenei
Project title	Devices, circuits, and components for high-efficiency wireless systems
Project description	Wireless systems are ubiquitous in telecommunication, industrial, IoT, remote control and sensing applications. To ensure high data transmission speeds, the high-frequency electronic components must often operate at high linearity under broadband signal excitation. In these conditions, achieving high energy efficiency is particularly complex. The objective of this project is to study methodologies for the characterization, design and optimization of electronic circuits and systems based on the latest generation of semiconductor devices, which potentially offer higher energy efficiency performances at the same production cost. The planned activities include performance analysis through the experimental characterization of components, device modeling for the definition of adequate design flows, as well as the study of advanced circuit topologies and optimal control strategies aimed at maximizing energy efficiency.
Mandatory traineeship	6 months
Company type	Company producing electronics components for high frequency wireless systems
Stay abroad	No

n. 3 - GREEN

Thematic area SNSI 2014-20	Digital Agenda, Smart Communities, Smart Mobility Systems Technological Development Trajectory: Technologies for dissemination of ultra-broadband connection and web economy
PNR 2021-2027	Thematic Area: Digital, Industry, Aerospace; sub-theme: Digital Transition and 4.0 Industry
Project title	Sustainable Communication Technologies for a Greener Future
Project description	The current emergency related to climate changes makes sustainability a major point in the agenda of international and national organizations. Owing to the pervasive

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popularity of ICT technologies, perceived as a primary need by current generation, sustainability cannot disregard urgent actions towards a sustainable (or green) ICT, to reduce its environmental cost. An outlook to the current ICT trend reveals that particular attention should be devoted to the radio access network since, despite energy efficiency has been regarded as a key variable in 5G, the new mobile network turns much more energy demanding than previous generations.

The PhD student will carry out fundamental research on truly sustainable communication technologies, with emphasis on their application to the future 6G system. Key performance metrics such as energy efficiency and energy consumption will be the main drivers for the design of new communications systems.

Mandatory traineeship	6 months
Company type	New Generation Wireless Networks
Stay abroad	No

n. 4 - GREEN

Thematic area SNSI 2014-20	Digital Agenda, Smart Communities, Smart Mobility Systems Technological Development Trajectory: Technologies for dissemination of ultra-broadband connection and web economy
PNR 2021-2027	Thematic Area: Digital, Industry, Aerospace; sub-theme: 5.4 Digital transition and 4.0 Industry; articulation: 7 Earth Observation, Telecommunications and Navigation
Project title	Greener B5G and 6G NTN through Virtualization and Softwarization
Project description	The contribution of the 5G and 6G infrastructure to the achievement of the UN Sustainable Development Goals is twofold. On the one side, the so-called enabling effect, in which the Communication Infrastructure is an enabler for other industries to achieve their environmental goals. On the other side, the direct effect that links to a Greener 5G/6G ecosystem. In addressing the enabling effect, the Non-Terrestrial Network component of the 5G/6G architecture plays a fundamental role so as to ensure a ubiquitous, flexible, and reliable connectivity. At the same time, the NTN component must be greener and environmentally sustainable. The proposed PhD project focuses on the virtualization and softwarization techniques of the NTN protocol stack with specific emphasis on the access stratum
Mandatory traineeship	6 months
Company type	Satellite manufacturing and development of the Non-Terrestrial Network (NTN) of the 5G ecosystem; softwarization and virtualization of the 4G and 5G radio access network
Stay abroad	6 months at the University of Luxembourg

*the translation of PNR 2021-2027 has been carried out by the PhD Unit