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

PROGRAMME'S NAME	COMPUTER SCIENCE AND ENGINEERING
DURATION	3 years
PROGRAMME START DATE	01/01/2022
LANGUAGE	English
COORDINATOR	Prof. Davide Sangiorgi (davide.sangiorgi@unibo.it)
CURRICULA	N/A
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	5
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	Languages and techniques for the automatic and optimal deployment of serverless applications
	2	PhD Scholarship	Cognification for sustainable high-performance computing
	3	PhD Scholarship	An integrated approach to cloud computing optimization - a study of the interplay between energy savings and security
	4	PhD Scholarship	Improving resilience in green energy management
	5	PhD Scholarship	Data-driven communities: Big Data, Data Visualization and Citizen science for a sustainable development

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, the exams taken and the marks obtained (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 [Studenti Online](#) (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	University degree final mark. Graduands shall be evaluated according to the Weighted Average Mark (WAM)	10 points max
	Publications	10 points max
Research proposal evaluation		80 points max

Research Topics

n. 1 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment. Development trajectory: Innovative, highly efficient production processes for industrial sustainability
PNR 2021-2027*	Research field: 5.4 Digital, industry, aerospace Areas of application: 5.4.1 Digital transition – I4.0 5.4.2 High-performance computing big data
Project title	**Languages and techniques for the automatic and optimal deployment of serverless applications**
Project description	Cloud Computing, that supports delocalization of computation, is a fundamental technology for resource consumption optimization, for instance, by moving the computation towards data-centers having availability of renewable energies. The project aims at the development of methods for a "green" use of the Cloud based on the serverless paradigm (or Function as a Service paradigm) that allows for the execution of only those "functions" that are requested by the user, without the need for services that consume resources also in the "idle" phase.
Mandatory traineeship	6 months
Company type	Companies working in the manufacturing sector interested in the digitalization of production processes belonging to a group focused on Big Data
Stay abroad	6 months

n. 2 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment. Development trajectory: Innovative, highly efficient production processes for industrial sustainability
PNR 2021-2027*	Research field: 5.4 Digital, industry, aerospace

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	Area of application: 5.4.3 Artificial intelligence Section 5. Artificial intelligence for environment and critical infrastructure
Project title	**Cognification for sustainable high-performance computing**
Project description	Exascale is the new frontier for High-Performance Computing (HPC). Scaling current HPC systems to millions of processor cores and billions of threads that are necessary for reaching the exascale goal is unsustainable since the resulting power consumption will exceed a gigawatt. The goal of this project is to cognify the system software of future HPC systems through novel algorithms and software technologies that exploit data science and artificial intelligence, so that energy efficiency is dramatically improved for exascale computing to be sustainable.
Mandatory traineeship	6 months
Company type	High-performance computing
Stay abroad	6 months

n. 3 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment
PNR 2021-2027*	Research field: 5.3 Security for social systems Area of application: 5.3.3 Cybersecurity Section 2. Cybersecurity and infrastructure security
Project title	**An integrated approach to cloud computing optimization - a study of the interplay between energy savings and security**
Project description	The proposed research plan shall be focused on analyzing energy consumption patterns correlated to cybersecurity, in high-availability cloud infrastructures, from two viewpoints: resources needed to guarantee security, and potential savings earned by effectively countering attacks. The expected result will be guidelines for the design and implementation of synergic optimization of security and sustainability, through the evaluation of known green networking techniques and proposal of novel solutions.
Mandatory traineeship	6 months
Company type	Design, examination, and management of network and computation infrastructure
Stay abroad	6 months

n. 4 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment. Development trajectory: Technologies for smart grids, renewable sources and distributed generation
PNR 2021-2027*	Research field: 5.3 Security for social systems Area of application: 5.3.3 Cybersecurity Section 2. Cybersecurity and infrastructure security Research field: 5.5 Climate, energy, sustainable mobility Area of application: 5.5.3 Industrial energy Section 2. Smart, flexible, integrated, resilient, and digitalized networks for a complete integration of renewable energy sources - FER
Project title	**Improving resilience in green energy management**
Project description	The growth of renewables capacity has been accompanied by a rapid digitalization in terms of smart connected devices, an irreversible IT/OT convergence and automating processes. While this integration is creating significant benefits, it is increasing system and operational vulnerabilities. This project aims to explore security by design solutions that will support the greater proliferation of renewables assets as critical infrastructure within electricity smart grids and smart water management platforms.
Mandatory traineeship	6 months
Company type	Utility
Stay abroad	6 months

n. 5 - GREEN

Thematic area SNSI 2014-20	Digital agenda, smart communities, smart mobility systems. Development trajectory: Technologies for smart building, energy efficiency, and environmental sustainability
PNR 2021-2027*	Research field: 5.4 Digital, industry, aerospace Area of application: 5.4.1 Digital transition – I4.0 Section 2. Sustainable communities
Project title	**Data-driven communities: Big Data, Data Visualization and Citizen science for a sustainable development**
Project description	Considering the increasing interest in "Twin green and digital transitions" actions, involving citizens in these sustainable development processes becomes critical. To this end, Citizen Science strategies should be investigated to obtain environmental and personal data via crowdsourcing/sensing and gamification. Further challenges concern the aggregation and classification (machine learning) and representation (data visualization) of the resulting big data to obtain the community's impact (ecological footprint) and to provide personalized recommendations (behaviour change).
Mandatory traineeship	6 months
Company type	IT (Information Technology)
Stay abroad	6 months

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