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

PROGRAMME'S NAME	BIOMEDICAL, ELECTRICAL AND SYSTEM ENGINEERING
DURATION	3 years
PROGRAMME START DATE	01/01/2022
LANGUAGE	Italian, English
COORDINATOR	Prof. Michele Monaci (michele.monaci@unibo.it)
CURRICULA	1. Automatic Control and Operational Research 2. Bioengineering 3. Electrical Engineering
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	6
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	Light superconducting technologies for decarbonized mobility
	2	PhD Scholarship	High efficiency electric drives for energy transition towards renewables
	3	PhD Scholarship	Renewable energy communities and storage systems
	4	PhD Scholarship	Innovative sensing methodologies and integrated architectures for next-generation, smart battery cells
	5	PhD Scholarship	Innovative and sustainable solutions for the remote monitoring of the cardiovascular and respiratory systems
	6	PhD Scholarship	Edge computing for advanced control and diagnosis of innovative smart mechatronic systems for minimal material and energy usage)

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 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	Second cycle degree final mark. Graduands shall be evaluated according to the Weighted Average Mark	Max 10 points as follows: - 10 points for 110 *cum laude* - 8 points for 110 and 109 - 6 points for scores from 105 to 108 included - 4 points for scores from 101 to 104 included - 3 points for scores from 95 to 100 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

Research Topics

n. 1 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment Technological Development trajectory: Innovative and environmentally friendly materials
PNR 2021-2027*	Thematic Area: Sustainable Mobility; sub-theme: Green and Clean Grids and Vehicles
Project title	Light superconducting technologies for decarbonized mobility
Project description	Greening of air transport is a prime goal toward sustainable mobility. High temperature superconductivity, including motors and power cables, allows to reach power density levels not achievable with conventional copper-based technology and is regarded as a key-enabler of electric air transport. This PhD program will explore, via a systemic design study, the viability of innovative propulsion and power distribution systems of a regional scale electric airplane based on high temperature superconductor technology.
Mandatory traineeship	6 months
Company type	Superconductors, Energy
Stay abroad	6 months

n. 2 - GREEN

Thematic area SNSI 2014-20	*Smart and sustainable Industry, Energy and Environment* Technological Development trajectories: Innovative, highly efficient production processes for industrial sustainability Technologies for smart grids, renewable sources and distributed generation
PNR 2021-2027*	Ambito Tematico: Clima, Energia e mobilità sostenibile Articolazione della ricerca: a) Reti e veicoli green e clean (5.1 articolazione 4) Generazione di energia da FER, accumuli energetici (5.3 articolazione 1)
Project title	High efficiency electric drives for energy transition towards renewables
Project description	Electric drives are spreading for their high efficiency, replacing hydraulics, pneumatics or internal combustion engines, thus reducing energy consumption with a strong impact on sustainability and climate. Moreover, electric drives are flexible and can be coupled to renewables that are mostly based on electrical energy. The research activities will be focused on both industrial applications and control methods towards maximum efficiency and performances.
Mandatory traineeship	6 months
Company type	SME in power electronics
Stay abroad	6 months by a Research Institute which specializes in Sustainable energy sources and Sustainable mobility

n. 3 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment Technological Development trajectory: Technologies for smart grids, renewable sources and distributed generation
PNR 2021-2027*	Thematic Area: Climate, Energy, Sustainable Mobility; sub-theme: Value Chains in Energy Communities – towards Decentralized Energy Systems
Project title	Renewable energy communities and storage systems
Project description	Innovation in the distribution and the use of electricity with efficient storage systems capable of balancing load and production from renewable sources. Two aspects: a) "local ancillary services by renewable energy communities", with the development of new operation and control tools considering recent Italian and European regulations; b) "new technologies of storage systems" focused on lithium batteries with low internal resistance, for fast charging and high currents, with the use of nanostructured electrolytes.
Mandatory traineeship	6 months

Company type	Electric power distribution system operator – Battery manufacturer
Stay abroad	No

n. 4 - GREEN

Thematic area SNSI 2014-20	Smart and Sustainable Industry, Energy and Environment
PNR 2021-2027*	Thematic Area: Climate, Energy, Sustainable Mobility; sub-theme: Sustainable Mobility; articulation: Green and Clean Grids and Vehicles
Project title	Innovative sensing methodologies and integrated architectures for next-generation, smart battery cells
Project description	Batteries are the key technology for the EU Green Deal targets towards zero-emission sustainable development and climate change mitigation. Activity will address the design of efficient sensing methodologies and related architectures and the definition of models, to be integrated at cell-level for the in operando and in situ estimation (automotive, aviation, drones) of state parameters and the diagnostics of faults and critical events. The main goals are a longer life of the cell, the improvement of safety, and the recording of its first operational cycle to allow for a possible second usage.
Mandatory traineeship	6 months
Company type	Battery cells Technology – Battery packs/modules Implementation – Instruments and tests for Electrified/Hybrid Transports – Development/Integration of Advanced BMS
Stay abroad	no

n. 5 - GREEN

Thematic area SNSI 2014-20	Health, nutrition, quality of life Technological Development trajectory: E-health, advanced diagnostics, medical devices and minimal invasiveness
PNR 2021-2027*	Thematic Area: Health; sub-theme: Technologies for Health; articulations: 1 Digital Health: Telemedicine, Digital Technologies and Sensors for Preventive, Participative and Personalized Medicine and for the Innovation of Health Services and Clinical Engineering at TLR > 4; 2 Artificial Intelligence for Precision Diagnostics, Personalized Therapies and for Organizational and Managerial Innovation of Hygienic Processes
Project title	Innovative and sustainable solutions for the remote monitoring of the cardiovascular and respiratory systems
Project description	The project aims to develop and validate innovative solutions for remote monitoring of cardiovascular and respiratory systems, with the aim of introducing new enabling technologies (e.g. IoT and AI) to enhance the ability to remotely control patients and optimize health resources. Specific objectives of the project are the identification of low environmental impact and reusable components, the development of methods to identify adverse events and the integration of heterogeneous data sources.
Mandatory traineeship	12 months
Company type	Design, development, and marketing of medical devices, with a focus on applications concerning physiological parameters' acquisition and processing.
Stay abroad	6 months

n. 6 - INNOVATION

Thematic area SNSI 2014-20	Thematic Area: Smart and Sustainable Industry, Energy and Environment Technological Development trajectory: Innovative, highly efficient production processes for industrial sustainability
PNR 2021-2027*	Thematic Area: Digital, Industry, Aerospace; sub-theme: Innovation for Manufacturing Industry; articulations: Circular, Clean and Efficient Industry; Smart Industry
Project title	Edge computing for advanced control and diagnosis of innovative smart mechatronic systems for minimal material and energy usage)
Project description	Sustainable and green development requires to overcome common industrial automation paradigms. Servomechanisms, which are crucial for machines and plants

	and have been neglected by Industry 4.0 mainstream, need to be renewed to minimize energy and material usage by using smart materials & mechanisms and codesign of structure and advanced control & diagnosis. Edge computing technology can enable it, if properly enriched with control-oriented hard real-time features.
Mandatory traineeship	6 months
Company type	Industrial Automation and Mechatronics
Stay abroad	No

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