

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



UNIONE EUROPEA
Fondo Sociale Europeo



PROGRAMME'S NAME	CIVIL, CHEMICAL, ENVIRONMENTAL AND MATERIALS ENGINEERING
DURATION	3 years
PROGRAMME START DATE	01/01/2022
LANGUAGE	Italian, English
COORDINATOR	Prof. Luca Vittuari (luca.vittuari@unibo.it)
CURRICULA	1. Engineering of infrastructure, resources and territory 2. Structural and geotechnical engineering 3. Chemical and process engineering 4. Materials engineering and industrial biotechnology
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	8
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	Development of non conventional biotechnological processes for the valorization and recovery of wastewater and industrial effluents
	2	PhD Scholarship	Development of highly efficient downstream processes to recover added-value products in dairy industry
	3	PhD Scholarship	Reservoir storage of hydrogen and CO2 as a support to the energy transition in the context of the New Green Deal
	4	PhD Scholarship	Dry reforming process analysis in chemical looping for syngas production
	5	PhD Scholarship	Bucket foundations for the exploitation of offshore wind in intermediate and deep water
	6	PhD Scholarship	Arundo donax panels for structural and non-structural purpose
	7	PhD Scholarship	New scenarios of autonomous and connected urban mobility: transport system simulation by digital twins
	8	PhD Scholarship	Application of smart technologies and of sustainable and multi-performance materials to the integrated retrofit of existing buildings

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).**

AFORM Settore Dottorato di ricerca

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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: <ul style="list-style-type: none"> - 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	Scientific value and ground-breaking nature of the proposal; suitability of the project to encourage exchange between research and the productive world; identification of parameters allowing the measurability of expected results; adherence of the project to the objectives of the reference action of PON R&I 2014-20 and the research topic	80 points max

Research Topics

n. 1 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment Development trajectory: Water and waste treatment systems and technologies
PNR 2021-2027*	Research field: 5.6 Food products, bioeconomy, natural resources, agriculture, environment Area of application: 5.6.1 Green technologies Section 3. Soil and water contamination prevention
Project title	Development of non conventional biotechnological processes for the valorization and recovery of wastewater and industrial effluents
Project description	Innovative processes for the treatment and recovery of wastewater and industrial effluents will be developed. In particular, nitrogen-rich matrices will be considered, among which digestate of anaerobic digestion processes for the production of biogas from organic residues. non conventional processes will be set up mediated by non-

	sterile mixed microbial cultures with peculiar capabilities of biodegrading priority pollutants and of accumulating mineral nutrients, so that the employment of sewage sludge will be avulated for the production of bioadditives for soils. Finally, treated water will be reused for the development of conventional fermentative processes, thus replacing the employment of fresh water.
Mandatory traineeship	6 months
Company type	Management and treatment of industrial or urban waste water
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 Health, nutrition, quality of life Development trajectory: Systems and technologies for packaging, preservation and traceability and safety of food production
PNR 2021-2027*	Research field: 5.6 Food products, bioeconomy, natural resources, agriculture, environment Area of application: 5.6.2 Science and food product technologies Section 6. Emerging trends in food product technologies and efficiency of transformation processes Area of application: 5.6.3 Bioindustry for bioeconomy Section 3. Recovery and enhancement of waste and organic products for soil regeneration and environment safety
Project title	Development of highly efficient downstream processes to recover added-value products in dairy industry
Project description	The project will apply innovative and sustainable methods to recover high added-value compounds from dairy wastes. Reuse of whey, the most relevant cheese by-product, allows to minimize the environmental impact of dairy industry. The idea is to use whey proteins to develop an edible antimicrobial coating, made by whey bioactive peptides, to increase food shelf life and prevent cheese spoilage. To this aim, we will implement an integrated membrane-system consisting of sequential membrane processes coupled with hydrolysis bioreactors in a circular process for the dairy industry.
Mandatory traineeship	6 months
Company type	Dairy industry/membrane production
Stay abroad	NO

n. 3 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment
PNR 2021-2027*	Research field: 5.5 Climate, energy, sustainable mobility Area of application: 5.5.3 Industrial energy Section 3. Industrial decarbonization: local production from renewable energy sources, efficient and sustainable use of energy and materials, energy vector transformation
Project title	Reservoir storage of hydrogen and CO2 as a support to the energy transition in the context of the New Green Deal
Project description	The research project aims to investigate the reservoir storage of CO2 and Hydrogen, as tools to support the energy transition in the context of the New Green Deal, using numerical simulation techniques. At the same time, the environmental sustainability of these activities will be assessed by means of Life Cycle Assessment methodologies. The fundamental issue of reservoir-fluid interaction and its long-term effects will also be investigated using innovative techniques such as Magnetic Resonance Relaxometry and Imaging.

Mandatory traineeship	6 months
Company type	Geoengineering services
Stay abroad	NO

n. 4 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment
PNR 2021-2027*	Research field: 5.5 Climate, energy, sustainable mobility Area of application: 5.5.3 Industrial energy Section 3. Industrial decarbonization: local production from renewable energy sources, efficient and sustainable use of energy and materials, energy vector transformation
Project title	Dry reforming process analysis in chemical looping for syngas production
Project description	Within the efforts to revise production processes towards the improvement of their environmental sustainability, the study envisaged in this project aims at the analysis, both experimental and theoretical, of a process for the syngas production from light hydrocarbons, in which carbon dioxide is used as oxygen source. The study will compare process and equipment solutions, also in terms of costs and environmental footprint, with reference to different choices for the hydrocarbon used as raw materials.
Mandatory traineeship	6 months
Company type	Process manufacturing – energy industry
Stay abroad	NO

n. 5 - 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: 5.5 Climate, energy, sustainable mobility Area of application: 5.5.4 Environmental energy Section 1. Energy production from renewable sources, energy accumulation and European and intercontinental networks
Project title	Bucket foundations for the exploitation of offshore wind in intermediate and deep water
Project description	The project explores the response of caisson foundations to combined loading in monotonic and cyclic conditions. The results apply to the design of floaters and jackets, the structural solutions used to exploit the offshore wind in intermediate and deep water. A thorough understanding of the behavior of the foundations supporting these types of structures is critical to extend the wind market to areas where good wind resources combine with narrow continental shelves. The approach is numerical and is devised to aid with a rational transfer of technologies between the offshore oil and gas and wind energy sector.
Mandatory traineeship	6 months
Company type	Engineering consultancy in the field of structure planning and offshore geotechnics
Stay abroad	6 months

n. 6 - GREEN

Thematic area SNSI 2014-20	Smart and sustainable industry, energy and environment Development trajectory: Innovative and environmentally friendly materials
PNR 2021-2027*	Research field: 5.6 Food products, bioeconomy, natural resources, agriculture, environment Area of application: 5.6.3 Bioindustry for bioeconomy
Project title	Arundo donax panels for structural and non-structural purpose
Project description	The project proposes an innovative use of Arundo donax as an engineered material. In particular, the idea is to design AD panels with different reed orientation, with particular attention to durability and the use of the eco-friendly adhesives. Prototypes

	will be made and mechanically characterized. In parallel, finite element modeling will be provided to optimize the orientation of the fibers in the panel. The ecological footprint and LCA of the panels themselves will also be analyzed.
Mandatory traineeship	6 months
Company type	Companies working in the construction sector for the production of structural components
Stay abroad	6 months

n. 7 - GREEN

Thematic area SNSI 2014-20	Digital agenda, smart communities, smart mobility systems
PNR 2021-2027*	Research field: 5.5 Climate, energy, sustainable mobility Area of application: 5.5.1 Sustainable mobility Section 3. Mobility and transportation services Section 5. Automatized, connected, and safe mobility
Project title	New scenarios of autonomous and connected urban mobility: transport system simulation by digital twins
Project description	The project focuses on the development of new models, also through the realization of "digital twin" of transport systems, for the realization of a resilient transport system and a safe, equitable, accessible and sustainable mobility (cluster "climate, energy and mobility" of the pillar "Global Challenges and European Industrial Competitiveness" of Horizon Europe). The quantitative approach to the simulation of these scenarios, in particular in the field of Urban Air Mobility, Sharing Mobility and Mobility-as-a-Service, can support transport companies and transport operators to develop and produce new mobility services.
Mandatory traineeship	6 months
Company type	Transportation service supplier
Stay abroad	6 months

n. 8 - GREEN

Thematic area SNSI 2014-20	Digital agenda, smart communities, smart mobility systems Development trajectory: Systems for urban environment safety, environmental monitoring and prevention of critical events or risks Smart and sustainable industry, energy and environment Development trajectory: Innovative and environmentally friendly materials
PNR 2021-2027*	Research field: 5.3 Security for social systems Area of application: 5.3.1 Structure, infrastructure, and network security Section 2. Methods, techniques and technologies for monitoring and preventing risks Section 3. Risk and resilience management
Project title	Application of smart technologies and of sustainable and multi-performance materials to the integrated retrofit of existing buildings
Project description	The objective of the project is developing technologies for an integrated and sustainable retrofit of existing buildings, by using sustainable materials obtained from processes based on circular economy and second raw materials. The integration of different retrofit objectives (architectural, energy, structural) will be supported by adoption of smart technologies and multi-performance materials. The topic of the project is fully consistent with the European Sustainable Development Strategy.
Mandatory traineeship	6 months
Company type	Construction and building industry
Stay abroad	6 months

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