ANNEX 1/a

PhD program: CITIES AND LANDSCAPES: ARCHITECTURE, ARCHAEOLOGY, CULTURAL HERITAGE, HISTORY AND RESOURCES

XXXVIII CYCLE – a.y. 2022-2023

Department	**Department of European and Mediterranean Cultures: Architecture, Environment, Cultural Heritages (DICEM) - Matera**	
Coordinator	Prof.ssa Antonella Grazia Maria Immacolata Romana GUIDA e-mail: antonella.guida@unibas.it	
Duration	3 years	
Web site	http://dicem.unibas.it/site/home/ricerca/dottorati-di-ricerca.html	
Admission requirements	a) University degree obtained under the previous educational systems (ex ante D.M. 509/99, whose legal course has at least a four-year term); b) Laurea specialistica/magistrale (D.M. 509/99 and D.M. 270/2004); c) Academic title obtained abroad and eligible for access to the PhD program, previously recognized by academic authorities, even in the context of inter-university cooperation and mobility agreements. In the absence of such approval, the candidate must apply a request in the application form according to the Art. 3 of this call.	
Available positions	**Tech4You**	**11 scholarships**
	Other	**1 scholarship CNR-IPSP** **1 scholarship INPS**

SCHOLARSHIPS

Ecosistema dell'Innovazione "Tech4You - Technologies for climate change adaptation and quality of life improvement" - ambito di intervento "5.Climate, Energy and Sustainable Mobility"

Codice identificativo ECS00000009 – CUP C43C22000400006

Scholarship n. 1	**Spoke 2 – Tecnologie per ridurre il consumo energetico e salvare la biodiversità** **GOAL 2.1 - PP 2.1.2**

Research topic

Administrative procedures for the ecological transition and the circular economy: simplification models

Topic description

The PhD programme entitled Administrative Procedures for the Ecological Transition and the Circular Economy: Models of Simplification aims to train legal skills that are useful for supporting the ecological transition and models of CE, particularly in the area of administrative organisation and management and in relations between business and public administration. The multi and interdisciplinary training and research course will start from a general framework of the Italian and European ecological transition strategy and the definition of a conceptual framework also for the interventions envisaged by the National Recovery and Resilience Plan (NRP), in order to create the conditions for acquiring a competence capable of supporting productive realities and public and private institutions in the transition from the linear to the circular model. The doctoral dissertation and prodromeic research should focus in particular on: - identifying legal instruments for the circular

economy and environmental sustainability in the reuse of secondary raw materials; - the development of a legal system for the certification of the process of recovery and reuse of second raw materials ; - the development of a technical-legal framework to support an IT platform for the management of the environmental regulatory system and the recovery of secondary raw materials with a view to the circular economy.

Scholarship n. 2	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale**) **GOAL 4.1 - PP 4.1.2**

Research topic

The memory of sound, from sources to performance. A basic competence in music, theater and multimedia is required, whichallows the candidate to follow the work from the filing and study of the sources of southern musicians of the past, in particular authors born in Basilicata, to their edition and dissemination through the production of accessible and inclusiveshows also in co-creation with the territory and the schools.

Topic description

The selected candidate will afford a research project in three phases: initially she/he will have to organize and control, under the guidance of the teacher-tutor, the digital acquisition in a single repository of documental archives and musical sources by authors born in Basilicata (for example, the fund of documents related to the family of the prince-musician Carlo Gesualdo which is still not digitized in the Castle of Venosa; the music output of the Matera composer Egidio Romualdo Duni with over 200 manuscripts and prints owned by the Bibliothèque Nationale de France in Paris; and other). A second level consists in cross-referencing the digitized materials with other existing Italian and foreign databases in order to complete the information. Both the first and second level of research will be carried out at a specialized firm which will be able to supply the necessary hardware and software instrumentation, after a period of training for the candidate. The third and most important work will be to make all the resulting information available to the community both in a form that can be consulted online and with the development of educational exhibitions, concerts and co-creation shows with local artists and international specialists to be presented in theatres, associations, festivals spread across the Lucanian or southern territory in general. The resulting doctoral thesis will give an account of the methodologies followed for the acquisition of data and the related study (phases 1 and 2); a second part of the thesis should describe in detail the results of the research (inventory, register, indices, apparatus, etc.) and the forms of scheduled dissemination.

Scholarship n. 3	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale**) **GOAL 4.2 - PP 4.2.1**

Research topic

Monitoring of cultural heritage with innovative technologies involving self-sensing materials

Topic description

The project aims to develop alternative technologies to those traditionally used for monitoring cultural heritages involving sensors installations (e.g., accelerometers) and data processing of locally detected signal to be correlated with structural damage. The planned research activities, on the other hand, is aimed to develop advanced technologies through the proposal of intelligent selfdiagnosing materials/elements, such as mortars or masonry blocks to be inserted within the existing masonry texture, for the monitoring and preservation of cultural heritages. The main goal is to make 'artificial permanent sensors' that perfectly blend with the supports where they are applied allowing, by measuring the variation of their own electromechanical characteristics, to estimate the variation of their own deformation state, detecting any anomalies within the structures (walls, vaulted structures). Research activities will be addressed to define the most appropriate mixtures to be used, obtained by combining traditional and possibly nanocomposite materials. In order to provide a protocol for the diagnosis and monitoring of cultural heritage, several approaches will be considered for measuring elements where these materials/elements will be applied.

Scholarship n. 4	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.2 - PP 4.2.1**

Research topic

Semantic definition of the architectural elements of the cultural and identity heritage, in relation to local materials, architectural quality and construction techniques, imported into a digital twin model

Topic description

During preliminary phases of conservation projects, a considerable amount of heterogeneous datasets are produced, gathered, analysed and interpreted. Abundant researches have gradually proven that Historic Building Information Modelling (HBIM) is a relevant alternative for the collaborative management of information related to existing structures. Apart from the obvious benefits of HBIM for information exchange among stakeholders during conservation project, the potential of such processes to support preservation strategies should not be neglected. Moreover, the recent developments of HBIM web-interfaces illustrate the need for additional investigation in strengthening the relationships between the digital model and the real-world to better support preventive conservation of heritage places. Besides, values-based approaches for the elaboration of conservation strategies have been gradually adopted in the last decades, both in academic and professional sector. The aim of research is to develop a comprehensive methodology to structure and integrate the cultural significance of tangible and intangible elements into HBIM models to be further taken into account in the analysis and simulation of data. The issue of the research is the application of Digital Twin (DT) principles to support site managers in the preventive conservation of their assets. Based on the analysis and simulations of data captured by onsite sensors, threats to the site integrity and corresponding preventive solution can be predicted in the DT environment. The integration and structuration of Heritage Values in HBIM models allow further evaluation process to estimate the impact of each suggested interventions on the conservation of features of significance.

Scholarship n. 5	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.3 - PP 4.3.1**

Research topic

Identifying species in urban green project and green solutions, developing irrigation and fertilization management plans aimed at optimizing natural resources

Topic description

The research activity has the main objective of developing a methodology for the analysis of green areas in an urban environment and for the measurements of its functions. The main types of urban greenspace, representative of the city of Matera, and case studies will be identified for each type. Nature Based Solutions (NBS) projects will be developed. The research intends to identify the main plant species (herbaceous, shrubby, tree) that are most suitable for the soil and climatic conditions that characterize the different sites. The study activity will allow the quantification of ecosystem services (ES) provided by urban greenspace (CO_2 sequestration, removal of atmospheric pollutants, infiltration and storage of water resources, mitigation of soil and atmospheric temperatures) through the monitoring of environmental parameters (soil and air temperature, soil water content, atmospheric pollutants) and vegetation parameters (vegetation growth rates, plant ecophysiological parameters - transpiration, stomatal conductance, photosynthesis) and the use of softwares. The aim of the research is to develop and evaluate management protocols of urban greenspaces through the definition of sustainable management plans for irrigation, fertilization and pruning and the identification of good agricultural practices (GAPs). The study will also include a digitized mapping of urban greenspaces of Matera city, which will be implemented with information related to irrigation, nutrition and pruning management plans.

Scholarship n. 6	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.3 - PP 4.3.1**

Research topic

Investigating co-creation process using approaches and tools of innovative languages (storytelling and design for all)

Topic description

The research activity will be carried out within the action "Cultural landscape and narrative itineraries"of pilot project OR4.3-PP1 Green Shapes for the Urban Regeneration Processes, Environmental, Social, Cultural and Tourism Sustainability. It aims to define and tell the network of slow use of the edge (extra-urban and peri-urban) and marginal (internal and fragile areas) territories as a device that generates value and multiplies the meaning of the landscapes crossed in its material and immaterial components. It intends also to promote the attractiveness of minor landscapes and to support the digital and green transition in the tourism and culture 4.0 sectors. The research will be oriented through co-creation processes (crowdsourcing) and the application of inclusive project methodologies (design for all). To achieve the objectives, integrated systems (ITstorytelling) will be used and innovative languages (gamification) will be tested. Physical networks will be identified and mapped and immaterial networks narrated. The definition of the outputs will be an integral part of the research. The candidate will have to demonstrate to be able to decode and manage complex processes. The candidate is also required to have basic knowledge of the research topic and the innovative languages connected to it.

Scholarship n. 7	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.3 - PP 4.3.1**

Research topic

Investigating the evolution of taste and food traditions in relation to lifestyles, territorial resources and the construction of cultural landscapes

Topic description

The research aims to study food traditions as parts of cultural systems and of the daily life of people. Food traditions are elements of continuity between different life experiences and between generations and inform the memory, habits, ties and daily practices. The research also intends to study, through ethnographic observation, food production as a central dynamic in the construction of cultural landscapes; the production of food, indeed, enables human groups to construct "anthropological places made up of words, memories, stories, people and relationships" (Teti, 2019). The investigation will also address food consumption patterns, meant as sets of practices that allow for the reconstruction of forms of memory and collective elaborations of taste and sensations, through the observation of the acts of eating, the rituals of preparing food and the methods of sharing the convivial moment in which the meal is consumed. From this perspective, food traditions are considered as complex cultural forms, which bring with them a whole series of ties and meanings linked to everyday life and shared forms of production, consumption and exchange.

Scholarship n. 8	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.3 - PP 4.3.2**

Research topic

Survey and analysis of geomorphic markers of climate change from inner areas of the chain and foredeep domains

Topic description

The research activity is related to the topic "Analysis and monitoring of morpho-sedimentary markers of climate change and environmental hazard in rural landscapes" of the Progetto Pilota G4.3-PP2 "Parks, forests, landforms, rural landscapes, and multifunctional agriculture". The goals of such a research line aim to define - by field survey, remote sensing, and geomorphological modeling - the erosion rates from inner rural areas of both the southern Apennines and Bradano foredeep, with particular emphasis to the sites where accelerated denudation phenomena linked to the global change are present. To this scope, UAV- and satellite-derived remote sensing techniques, and connected detectors (Internet-of-Things) for the acquisition of data useful to the definition of topographic, soil, and vegetation features, will be used and supported by advanced statistical methods (e.g. machine learning). Outcomes may represent a base for the standardization of measurements and data proveining from the different acquisition methods and for the establishment of a protocol of best practices with the goal to better estimate the climate change impact on wider areas of Basilicata and Calabria, so implementing the protection strategy in the agronomic productive sectors.

Scholarship n. 9	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.3 - PP 4.3.2**

Research topic

Knowledge, interpretation, planning and design of the territory and landscape with reference to the processes of ecological transformation

Topic description

The research activity provides skills in theoretical and practical elaborations aimed at the knowledge, interpretation, planning and design of the territory and landscape with reference to the processes of ecological transformation. Particular attention will be given to: (i) organizational and relational arrangements in settlement, infrastructural, rural and natural systems, at different scales; (ii) the definition of integrated, interscalar and inclusive strategies for the redevelopment, regeneration and territorial rebalancing. The activities will be placed in a perspective of enhancement of the historical and cultural heritage and of the new patrimonialization processes with particular regard to the reconstruction of local policies and their implications for the improvement of the quality of the landscape, the environment and the living conditions. taken into account as factors for improvement, ecological interconnection and the increase in biodiversity, equity and social inclusion, spatial justice and environmental, social and economic sustainability.

Scholarship n. 10	**Spoke 3 - Tecnologie intelligenti per una filiera alimentare e forestale sostenibile** **GOAL 3.3 - PP 3.4.1**

Research topic

Irrigation management and the interaction of Water with Soil-Plant-Atmosphere Systems

Topic description

The Research activity will be carried out within the Action TT: Application and demonstration of developed technologies and optimized models to the irrigation districts of Calabria and Basilicata Regions (Sothern Italy) - Pilot Project TT3.3-G3.3-PP1: Valorization and management models of water resource in high-value crop systems - OR SMART WATER - SPOKE 3 - SMART TECHNOLOGIES FOR SUSTAINABLE AGRI-FOOD CHAIN AND FORESTRY. The research Project tends to determine, through the creation and evaluation of decision support systems (DSS), strategies aimed at: - a correct irrigation scheduling; - an efficient, sustainable and geo-referenced use of water resources. The research activity will make use of lysimetric studies, ecophysiological studies and soil-plantatmosphere water flow modeling for a sustainable use of water resources in herbaceous cropping systems. The expected results can represent a reference platform for the management of the acquired data, contributing to: - reduce the environmental impact of irrigation and fertilization techniques; - improve crop yields and quality; - make available to the farmers several expert systems and platforms for a rational management of irrigation technique in the Basilicata and Calabria areas.

Scholarship n. 11	**Spoke 4 – Resilienza e accessibilità per la valorizzazione del patrimonio locale (culturale e naturale)** **GOAL 4.2 - PP 4.2.1**

Research topic

Data management for risk assessment of cultural heritage

Topic description

The project focuses on the development of strategies for data management aimed at cultural heritage risk assessment. Firstly, the activities will involve a state-of-art study, with particular reference to multilevel approaches. The latter, starting from qualitative information, make possible to carry out territorial assessments, capable of providing decision-making tools for the identification of intervention priorities. Afterwards, acquiring more information, punctual assessments will be considered, requiring the implementation of specific numerical models for the response assessment and the interventions design.
The project will be addressed to propose a multilevel method for the knowledge and risks assessment of cultural heritage, starting from the data collected in order to develop numerical models with different approximation levels. The research will allow the development of techniques for incremental information management and consultation, considering only the main quantities contributing to the assessment of the different risks considered. Any information collected through instrumental monitoring and/or performed with innovative methodologies will also be taken into account in this approach.

OTHER SCHOLARSHIPS

Scholarship n. 1	**CNR-IPSP "Consiglio Nazionale delle Ricerche-Istituto per la Protezione Sostenibile delle Piante"**

Research topic

Development of innovative plant-derived formulates for a sustainable management of parasites and pathogens of agricultural crops

Topic description

The ban of most synthetic pesticides have raised an increasing demand for new innovative pesticide products suitable for an effective and environmental safe control of crop pests and pathogens. Presence in many plant species of a large variety of biocidal compounds (glucosinolates, terpenes, alkaloids and more) highly active on crop pests (insects, nematodes) and pathogens (fungi, bacteria) suggests their use of new safe pesticides. The exploitation of this pesticidal potential is limited by the lack of technical formulations suitable for the application in agriculture of these potential plantderived products and by the scarce information on their mechanisms of action and their impacts on plant and beneficial soil components. The research activity of the PhD project will be focused on the development of new innovative formulations of plant products (extracts, oils or their constituents) through the use of nanoencapsulation and plasma technologies and the evaluation of their efficacy on crop parasites and pathogens as well as on their impacts on plant health and soil microflora. The pesticidal activity of the new products will be tested on selected crop pests, such as phytoparasitic nematodes, either by in vitro assays on the infective stages of the target pests and experiments in soil in controlled conditions (growth chamber, greenhouse). Molecular pathways involved in the mechanisms of biocidal activity of the new products on target crop pests will be elucidated by RNA-PCR techniques, following the expression of selected nuclear and mitochondrial genes involved in key functions such as viability, motility, protein synthesis, membrane integrity and stress response. Plant response to the experimental products will be investigated by phenotyping and biochemical analyses of stress markers (ROS, H2O2 etc) as well as by transcriptomic analyses (e.g RNA-seq and/or RT-qPCR) for identifying differentially modulated genes and pathway involved in plant growth and defence responses. Impact of the experimental formulates on rhizosphere microbiome biodiversity will be investigated through metabarcoding NGS-based approach, PCR-based molecular methods and/or conventional microbiology techniques.

Scholarship n. 2	INPS

Research topic

Formulation of new high-efficiency biofertilizer products for application in sustainable agriculture

Topic description

The proposed research is consistent with the disciplinary areas and expected spin-offs of the 4.0 program. The focus is on the development and integration of innovative technologies that can optimize production processes. Greater flexibility and productivity of processes aimed at obtaining biofertilizer products is pursued. A growing interest of both research and private industry is devoted to the development of products that can restore and/or improve soil quality and fertility while fully respecting human health and the environment. One innovative technology that aims to address this challenge is the development of new biofertilizers containing beneficial microorganisms that can improve soil functionality. Biofertilizer products will be defined based on selected microorganisms that, when applied in a given fruit-growing ecosystem, are able to establish beneficial synergistic interactions with the native microbial component of the soil and the plant. Starting with a laboratory approach, the evaluation of biofertilizers in the field will be continued in order to estimate their efficacy and persistence, which are influenced by the multiple variables of the fruit system.

A period in the company or research center (max 6 months) and abroad (max 6 months) is mandatory.

Admission procedure	The admission procedure is conducted through the: **a) evaluation of qualifications** **b) evaluation, as part of the interview, of a research project**, drawn up in Italian and English using the format set out in **Annex C** to the call for proposals, concerning the subject/type of grant for which you are competing (Tech4You, other) **c) video conference interview** using google meet	
Evaluation criteria	**a) evaluation of qualifications:** up to a maximum of **25 points** minimum score to access the interview **15 points** **b) interview:** up to a maximum of **75 points** the interview is passed for a score not less than **45 points** **Minimum total score: 60 out of 100.**	
Assessable qualifications	**Graduation Thesis** (The candidate must also submit a summary in Italian or English of the thesis of max 16.000 characters)	max **7** points
	Degree mark (For candidates who have not yet obtained the degree, the weighted average of the marks obtained in all the exams of the degree program, taken on the date of submission of the application for admission, will be evaluated)	max **12** points

	Scientific publications (Articles in national and international scientific journals, proceedings of scientific conferences, books or book chapters)	max **3** points
	Other titles (University degrees or Master Specialization, Research Grants, Scholarships, Erasmus scholarships and periods of activity abroad, …)	max **3** points
Interview program	The interview, which can be held in Italian, Spanish or English, will focus on the discussion of the submitted research project and is aimed at ascertaining the candidate's scientific interests and aptitude for research. During the interview, the knowledge of the Italian language will be ascertained for foreign candidates.	
Foreign language	**English** (knowledge of a foreign language will be assessed during the interview)	
Schedule of the admission tests	**Evaluation of qualifications: results will be available from <u>January 26, 2023</u>** on the website http://portale.unibas.it/site/home/didattica/dottorati-di-ricerca.html **Day of the interview: <u>January 30, 2023 - 10:30 a.m.</u>**	