



PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 39th cycle

PNRR 117 Research Field: ADAPTIVITY AND SUSTAINABILITY OF TECHNICAL TEXTILES FOR CULTURAL HERITAGE PROTECTION

Monthly net income of PhDscholarship (max 36 months)

€ 1275.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Nowadays the "species jump" of current technical textiles (mostly petroleum-based composites) is underway, driven forward by the technical innovations in green chemistry on one hand, and electronic miniaturization on the other. Many sectors of technical textiles are dreaming a further level of adaptivity and smartness of fabrics and soft materials, without disregarding their environmental sustainability. The motivation behind of the overall research proposal is that the valorization of cultural heritage assets needs more energy-saving and environmental friendly solutions, as it seems one of built environment target where the application of innovative and green textiles might have a deep economical and social impact. Two main goals are achievable thanks to this research path. On the one hand, the research will select, analyze, test and assess new materials, products, semi-products developed by the reusing, recycling and remanufacturing of post-industrial textiles scraps, with the final aim to create innovative green fabrics for architecture application (indoor and outdoor). On the other hand, the research aims to open an exploration on the topic of interactivity of the building skin, focusing mostly off the inner layer of the building facades and even narrowing the topic to the protection and the implementation of thermal,



	acoustical and optical behavior of cultural heritage assets, thanks to the integration of smart textiles. This research path will be coherently developed within the goals of the National Recovery and Resilience Plan (PNRR), in particular with the "M2C3 Green Revolution and Ecological Transition", and its sub task of "Energy efficiency and upgrading of buildings".
Methods and techniques that will be developed and used to carry out the research	The thesis will be developed with industrial funding of Carlo Giovanardi & Company s.n.c. (Villimpenta, Mantova, Italy; https://www.giovanardi.com). The research work will be developed partially in the headquarter of Giovanardi firm and partially at Politecnico di Milano. A period of research abroad will be also planned at one of the outstanding academic members of the European TensiNet Association (Brussels), with the final aim to set a cross-disciplinary collaboration fruitful for achieving the expected results.
Educational objectives	<ul style="list-style-type: none"> •Methods and tools for eco-designing applicable to the field of textile architecture •Interdisciplinary approach on the topic of cultural heritage protection, daily maintenance and valorization of material and immaterial cultural heritage assets •Sustainable innovation and business models of product and service applicable to the field of textile architecture with the main focus on its adaptivity and interactivity •Development of proof-of-concepts of new materials and/or building components, starting from industrial-scrap and by-products of other industrial sectors •Environmental and Economical evaluation of different developed Proof-of-concepts of smart, adaptive architectural membrane
Job opportunities	<ul style="list-style-type: none"> •Expert of soft, smart architectural membrane •Expert of multi-criteria evaluation of building products •Designer with expertise of acoustic, optical, thermal behaviour of thin and flexible composites materials applicable in architecture



	applicable in architecture
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 3 PhD Students
Name of the research directors	Prof. Alessandra Zanelli

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	637.5 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Carlo Giovanardi & Company s.n.c. (Villimpenta, Mantova, Italy; https://www.giovanardi.com)
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	To be defined at one of the academic members of the European TensiNet Association (Brussels)
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Additional support:</p> <p>Budget for the research activity (only for positions supported by scholarship): total amount Euro 5197.60 per student.</p> <p>In detail:</p> <ul style="list-style-type: none"> - 1st year Euro 1732.53 - 2nd year Euro 1732.53 - 3rd year Euro 1732.54 <p>Additional information about the organization and regulations of ABC-PhD programme can be found in the Regulations for the 39th Cycle of ABC-PhD: download is available at</p>



link: <https://www.dottorato.polimi.it/corsi-di-dottorato/architettura/architettura-ingegneria-delle-costruzioni-e-ambiente-costruito>

Additional information about ABC department and ABC-PhD programme: available at link: <https://www.dabc.polimi.it/>

Desk availability: The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.

This scholarship is funded by the PNRR national programme D.M. 117. This means that the owner of the position will be obliged to submit periodical reports about her/his activity.