

PhD in BIOINGEGNERIA / BIOENGINEERING - 40th cycle

THEMATIC Research Field: MAGNETO-ELECTRIC, BIO-HYBRID INTERFACES AS NOVEL ENABLERS FOR WIRELESS ROBOTIC CONTROL AND DRUG MANAGEMENT

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

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	The main objective of this work is to study the possible application of innovative tools based on the exploitation of electromagnetic fields, for the development of biohybrid interfaces able to provide a wireless interconnection between living and artificial systems. More in detail, new strategies for stimulation peripheral nervous system functions and for instructing materialbased cellular functions will be investigated. Moreover, the PhD activities will be also focused on the study of the possibility of Magneto-electric nanoparticles as tool for drug delivery for cardiac applications. For the period 01 December, 2024 ?31 July, 2026 (month 01 ? month 20), the research will be carried out in the framework of the CNR-IEIIT project ?Fit4MedRob- Fit for Medical Robotics? Piano Nazionale Complementare (PNC) ? Decreto Direttoriale n. 931 del 6 giugno 2022 ? ?Avviso per la concessione di finanziamenti destinati ad iniziative di ricerca per tecnologie e percorsi innovativi in ambito sanitario e assistenziale, codice PNC0000007; CUP: B53C22006960001?. For the period 1st August 2026 ? November 30, 2027 (month 21 ? end of doctoral program), the research will fit in the framework of other project activities of CNRIEIIT on magneto-electric nanoparticles for drug management in interventional cardiology.



Methods and techniques that will be developed and used to carry out the research	Multi-scale and multi-physics modeling and computation electromagnetic techniques will be developed to properly model the interaction between electric/magnetic fields and biological tissues, at the interface with bio-robotics and medical devices. Preliminary validation of the developed models in a laboratory setting will be also considered, to gain a more complete view on the biomedical topics which constitute the focus of the research project.
Educational objectives	 To train the PhD student in computational methods and techniques for the modeling and characterization of novel tools for bio-robotics and medical devices interfaces To train the PhD student in basic laboratory procedures and assays for the fabrication and validation of the bio-hybrid interfaces predicted via multi-physics modeling approaches To gain a multidisciplinary knowledge in the bioelectromagnetics field
Job opportunities	CNR IEIIT has large opportunities for an interdisciplinary research career in science.
Composition of the research group	1 Full Professors 0 Associated Professors 8 Assistant Professors 1 PhD Students
Name of the research directors	Prof. Paolo Ravazzani - Prof. Giulia Suarato

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)	

POLITECNICO DI MILANO



Scholarship Increase for a period abroad		
Amount monthly	700.0 €	
By number of months	6	

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The student will be encouraged to attend courses with subjects bioelectromagnetics, statistics, stochastic modeling and biorobotics either at POLIMI and at CNR IEIIT.

Moreover, the student will be involved in the educational program developed under the project Fit4MedRob with the aim of developing specific expertise in the biorobotics field.