



PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 37th cycle

**THEMATIC Research Field: DIGITAL TWINS OF ELECTRICAL SYSTEMS FOR SMART
GRIDS 4.0**

Monthly net income of PhDscholarship (max 36 months)

€ 1180.0

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 purpose of the research activity is to develop new simulation methodology and advanced analysis systems based on digital twin technologies, which is the foundation of industry 4.0. We want to create a digital twin of smart and microgrid. The digitalization of the electricity sector will in fact bring enormous advantages especially for the development of planning and optimization in view of electrical expansions due to the integration of renewable sources and electric vehicles. The research will be based on three main topics:

- 1) RealTime and Hardware in the Loop simulation of the electrical network, including communication and data exchange protocols with a view to the Internet of Things
- 2) Data-driven modeling (based on data collected from real plants) to be integrated in the RealTime simulation
- 3) Development of innovative control and efficiency methodologies based on themes 1 and 2 for Efficiency of energy production, Integration of renewable sources and electric vehicles, safety and cyber-security of networks.

Methods and techniques that will be developed and used to carry out the research

Methods and techniques include: circuit theory and simulation, simulation (at system, unit, device and component level) by means of mixed approaches, nonlinear techniques, reduced-order techniques, model-parameters extraction from measurements, etc..

Educational objectives

The aim is to form highly qualified PhD candidates in:



	develop and managing numerical simulation and analysis of electrical systems and circuits in the Digital twin and BIM contest.
Job opportunities	Successful fulfilment of the research programs associated with these Scholarships will provide PhD candidates with the qualifications required to seek employment in diversified industry and university sectors in the EE field, such as Aerospace, Transportation (Automotive, Aeronautics, and Railway), Energy, Environment, etc.
Composition of the research group	1 Full Professors 2 Associated Professors 1 Assistant Professors 2 PhD Students
Name of the research directors	Giambattista Gruosso

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	566.36 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Educational activities: Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc.. The amount is about Euro 3.100,00.</p> <p>Teaching assistantship: Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD</p>



student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: individual use.

Desk availability: individual use.