



PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 39th cycle

THEMATIC Research Field: ELECTRIC POWER CONVERSIONS AND SYSTEMS

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	
<p>Motivation and objectives of the research in this field</p>	<p>The research field is divided into two main categories: the first is related to automotive applications while the second one is related to renewable energies and their integration in power systems.</p> <p>For the first point, the innovation in automotive are driven by developing of electric propulsion and storage systems. In this scenario the research is mainly focused in: i) studying, designing and modelling innovative power converters for traction drives and onboard electric actuators; ii) studying and modelling of storage systems optimizing their use for transportation.</p> <p>For the second point, nowadays, converter-interfaced power sources (which include also electrical energy storage devices) are spreading throughout the power grids (at high, medium, and low voltage levels). Moreover, electrical drives are increasingly gaining importance, also because they foster energy efficiency.</p> <p>In this context, some of the major objectives of the research activity are: (i) the modelling of static electrical energy conversion devices; (ii) the modelling of electromechanical devices (e.g., rotating machines, switches); (iii) the design of innovative control strategies to optimally exploit renewable sources, storage capabilities, and to improve load behaviour and dynamic responses; (iv) the design of optimal management strategies of the various resources making up micro-grids or portion of a power systems.</p>
<p>Methods and techniques that will be</p>	<p>The methods that will be used to perform the research</p>



<p>developed and used to carry out the research</p>	<p>activity are based on traditional tools from mathematics, physics, circuit theory, and control theory, along with more advanced techniques such as model predictive control, stochastic programming, Monte Carlo theory, neural networks. Development of algorithms for design and operation modelling of electromagnetic, electromechanical and electronics components. Definition of control techniques and schemes to optimize the performances of electrical drives. Experimental activities for parameter identification and validation tests. Prototype design, realization and test. Microcontroller and FPGA programming for power electronics. Design and implementation of optimization algorithm for the coordinated (optimal) management of converter-interfaced power sources (including energy storage devices) with respect to different objective functions (e.g., ancillary services provision, economic benefits).</p>
<p>Educational objectives</p>	<p>Refinement of skills in design and optimization of components and drives. Assistance in development of models of complex electromechanical and electronic systems. Training in actively contributing to the project team, both in academic research and in activities with industrial partners.</p>
<p>Job opportunities</p>	<p>R&D Italian Firms, University career.</p>
<p>Composition of the research group</p>	<p>1 Full Professors 4 Associated Professors 3 Assistant Professors 8 PhD Students</p>
<p>Name of the research directors</p>	<p>Francesco Castelli Dezza, Luigi Piegari</p>

<p style="text-align: center;">Contacts</p>
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<p style="text-align: center;">Additional support - Financial aid per PhD student per year (gross amount)</p>
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Housing - Foreign Students	1st year	2nd year	3rd year
	1500.0 € per student	1500.0 € per student	1500.0 € per student
	max number of financial aid available: 1, given in order of merit ..		
Housing - Out-of-town residents (more than 80Km out of Milano)	1st year	2nd year	3rd year
	1000.0 € per student	1000.0 € per student	1000.0 € per student
	max number of financial aid available: 1, given in order of merit ..		

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

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.. This amount is equal to 10% of the annual gross amount, for 3 years.

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

Computer availability: individual use.
Desk availability: individual use.