



PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 40th cycle

**THEMATIC Research Field: MODELING AND CHARACTERIZATION OF ENERGY
STORAGES SYSTEMS ORIENTED TO GRID INTEGRATION**

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| Monthly net income of PhDscholarship (max 36 months) |
| € 1500.0 |
| In case of a change of the welfare rates during the three-year period, the amount could be modified. |

| Context of the research activity | |
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| Motivation and objectives of the research in this field | <p>The research activity is oriented to the analysis of energy storage technologies with a primary focus on their integration into electrical grids. This study aims to develop mathematical models that accurately represent the behavior and performance of various energy storage systems with particular focus on batteries.</p> <p>The characterization aspect involves a comprehensive analytical and experimental analysis of the storage systems under different operating conditions, exploring factors such as efficiency, response time, and reliability. Through advanced data driven modeling techniques the research seeks to enhance our understanding of how these systems interact with the grid and contribute to overall stability and efficiency.</p> <p>This research will provide valuable know-how on energy storage systems, for optimizing their usage, supporting the integration of renewable energy sources into grids for a more sustainable and resilient energy infrastructure.</p> |
| Methods and techniques that will be developed and used to carry out the research | <p>The research will require to develop procedures and test beds for the characterization of storage systems to define data driven mathematical models of their behavior .</p> <p>Analog and Digital processing methods for measurement and uncertainty estimation will be employed.</p> <p>The research will be funded by ENI spa and developed in collaboration with their research centre located in Novara. The activity will be carried out mainly in the Campus Leonardo of Politecnico di Milano.</p> |



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| | Leonardo of Politecnico di Milano. |
| Educational objectives | This research theme has the aim of forming a highly qualified engineer in the field of Electrical Engineering, with particular focus on Instrumentation and Measurement, with specific skills on uncertainty estimation, signal processing, instrumentation, electrical system characterization, systems diagnosis and electrical/non-electrical quantity measurements. |
| Job opportunities | The natural position for a PhD achieving this curriculum is any R&D position in the R&D department of electric utilities and factories in electrical energy field, supervision of in-field measurements and monitoring, calibration labs and research centers both in and outside academia. |
| Composition of the research group | 3 Full Professors 3 Associated Professors 1 Assistant Professors 4 PhD Students |
| Name of the research directors | Prof. Marco Faifer |

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

| Scholarship Increase for a period abroad | |
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| Amount monthly | 750.0 € |
| By number of months | 6 |

| Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information |
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| <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</p> |



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*.