

Research options available for topic B

Research topics a) and b) offered by every Doctoral Course involved in UNIPH_D are frameworks within which every applicant has to present an original research project in collaboration with a Supervisor at the University of Padua.

Potential Supervisors at Unipd have proposed the following detailed research options, which are related to the research topic. They are offered as a guideline and should facilitate your contact with potential Supervisors. Supervisors' e-mail is specified in every research option table. You are welcome to contact them directly.

Note that this research option list is not at all exhaustive and, within the topic you have chosen, you are free to propose a different research project.

Doctoral Course	MECHATRONIC AND PRODUCT INNOVATION ENGINEERING
Macro-area	Physical Sciences and Engineering
Department name	Department of Management and Engineering
Webpage	http://www.gest.unipd.it/en/research/phd-programmes/mechatronics-and-product-innovation-engineering?set_language=en
Research topic B	<p>Advanced mechatronics technologies for future competitive industrial and logistics systems under the digital change</p> <p>The improvement of energy efficiency and the greater exploitation of renewable energy sources by means of power electronics converters are crucial objectives in many industrialized countries, representing a necessary condition for sustainable energy growth. In this framework, the development of high-efficient and grid-friendly power electronics converters play a key role, being the enabling technology for the exploitation of photovoltaic and wind renewable sources, management of energy storage as well as for the realization of electric mobility concepts. The scope of the PhD is to develop advanced power electronics converters, exploiting ongoing breakthrough in wide-bandgap semiconductor devices and adopting advanced control and monitoring functions. Moreover, future DC and AC smart nanogrids will be dominated by power electronics converters and the PhD research will be also aimed at the development of control techniques that enables a “grid-friendly” operation, including the improvement of the power converter stability in a complex grid, the input impedance shaping, and the adoption of advance monitoring functions, such as on-line stability monitoring and automatic tuning based on mission profiles and operational data.</p>

Link to the UNIPHD Call (Academic Year 2022/2023)	https://www.unipd.it/en/uniphd
Latest Update	12.01.2022
#Number of available Research Options	1 <i>Scroll down to see all the Research Options</i>

#1 Research Option Description

Doctoral Course	PhD in Mechatronics and Product Innovation Engineering
Department name	Department of Management and Engineering (DTG)
Research topic B	Advanced mechatronics technologies for future competitive industrial and logistics systems under the digital change
Research option	Grid-friendly Power Electronic Converters in DC and AC Smart Nanogrids for future integration of Renewable Energy Systems.
Supervisor	Paolo Mattavelli, paolo.mattavelli@unipd.it Power Electronics Group at the university of Padova
Webpage	https://www.unipd.it/en/scheda-personale?key=438572378950E54A31C4240B9765ECE4
Context of the research activity and objectives	The improvement of energy efficiency and the greater exploitation of renewable energy sources by means of power electronics converters are crucial objectives in many industrialized countries, representing a necessary condition for sustainable energy growth. In this framework, the development of high-efficient and grid-friendly power electronics converters play a key role, being the enabling technology for the exploitation of photovoltaic and wind renewable sources, management of energy storage as well as for the realization of electric mobility concepts. The scope of the PhD is to develop advanced power electronics converters, exploiting ongoing breakthrough in wide-bandgap semiconductor devices and adopting advanced control and monitoring functions. Moreover, future DC and AC smart nanogrids will be dominated by power electronics converters and the PhD research will be also aimed at the development of control techniques that enables a “grid-friendly” operation, including the improvement of the power converter stability in a complex grid, the input impedance shaping, and the adoption of advance monitoring functions, such as on-line stability monitoring and automatic tuning based on mission profiles and operational data.
Infrastructures	The power electronics laboratory in the Vicenza Campus is fully equipped for converter prototyping test e with programmable bidirectional power supplies (up to 1kV, 100A, 50kW), oscilloscopes, DSP control boards, infrared camera for thermal analysis, Hardware in the loop simulators and pre-compliance EMC analyser.
Skills and competencies for the development of the activity	Advanced knowledge in Power Electronics systems. Experimental capability to develop power electronics circuits, including the evaluation of digital control algorithm for power electronics systems.
Training offer	

	PhD Courses available at the University of Padova in several PHD Courses. The main focus of the training will be in Power Electronics, Control, and Reliability in power electronics.
Possible Secondments	University of Chalmers (SE)