


ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

DENERG - Advanced Electrified Powertrains Modeling and Control using Innovative Power Electronics and Electric Motors

Funded By	Dipartimento DENERG
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Context of the research activity	<p>The transportation electrification is a key strategic sector in the development of sustainable vehicles based on batteries, fuel cells, or hybrid solutions with internal combustion engines based on alternative fuels.</p> <p>The development of high-efficiency, high power density solutions at competitive costs require new power semiconductor technologies (such as silicon-carbide SiC and gallium-nitride GaN) and new three-phase or multi-phase electric motor solutions.</p>
Objectives	<p>The aim of the doctoral thesis is the study and advanced modeling of electrical components used in the powertrains of future electrified vehicles, together with the control of new innovative electric traction motors without the use of rare earth materials. The thesis includes the following activities:</p> <ul style="list-style-type: none"> • Advanced modeling of the electrical components of electrified powertrains (inverters, motors, chargers, battery), to obtain system models able to find the most suitable solutions to maximize the overall efficiency of the system. • Innovative control solutions for three-phase and multi-phase electric traction motors without the use of rare earth materials. • Implementation and testing of the identified solutions for electric and hybrid vehicles. <p>The doctoral thesis will be carried out at the Power Electronics Innovation Center of the Politecnico di Torino.</p>
Skills and competencies for the development of the activity	<p>The PhD candidate must have:</p> <ul style="list-style-type: none"> • Master Degree in Electrical Engineering • Excellent knowledge of power electronics and control solutions for power conversion, including torque control solutions for traction applications • Excellent knowledge of simulation environments for control of electric motors (Matlab/Simulink) • Good knowledge of real time control and programming skills



The candidate must demonstrate very good capability in facing new challenges and must be very motivated in reaching the research objectives.