

PhD in Mechanical Engineering

Research Title: Optimization of more electric actuation systems

Funded by	Power Electronics Innovation Center (PEIC) Politecnico di Torino
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Context of the research activity	<p>The replacement of conventional actuation or transmission systems with electrical or electromechanical ones is a consolidated trend in automotive, aerospace and industrial fields. This is justified by the better control capability, the better energy efficiency also enabled by the energy recovery capability that is usually not achievable by more conventional means. Despite the considerable advantages, the more electric actuation systems are still limited in the real applications by the larger weight and size, the higher cost, and reliability issues. These limiting factors can be addressed by a true integration of the two key elements of a more electric actuation system, i.e. the electric machine and the mechanical transmission. This integration still deserves a scientific investigation to grasp the potentialities that are still largely unexploited today.</p> <p>The research work will be carried out in a multidisciplinary environment inside the PEIC initiative.</p>
Objectives	<p>The overall objectives of the activity are:</p> <ul style="list-style-type: none">• Literature analysis on more electric actuation systems for automotive, aerospace and industrial applications.• Definition of design application cases.• System optimization of transmission and e-machine to minimize size, weight and improve the efficiency in direct mode and in energy recovery mode.• Exploration of possible benefits of different conventional speed reducer technologies (parallel axis, planetary gears, cycloidal gear).• Exploration of not conventional speed reducers such as magnetic gears.• Design of laboratory prototypes to validate the optimized design.

Skills and competencies for the development of the activity

- Experience and willingness for laboratory activity in multi-disciplinary team environment.
- Background in mechatronic systems engineering.
- Mechanical and electromechanical design
- Good logical and analysis capability, including good self-organizational mindset
- Computer simulation of multi-domain systems
- Hardware testing