



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 37th cycle

Research Area n. 2 - Sustainable Mobility

THEMATIC Research Field: **ADVANCED MECHANICAL DESIGN OF AUTOMOTIVE ELECTRIC MOTORS**

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

Motivation and objectives of the research in this field

The growing demand for reducing CO2 emissions has made major automotive OEMs to invest significantly into electrification. Electric motors for automotive applications deserve a fully new design based not only on the magneto-electric circuitry but also on proper material selection and topological design. Currently, electric motors are inherently physical components, subject to a number of conflicting constraints originating from strict lightweight requirements, thermo-fluid dynamics, mechanical resistance and compliance, wear, vibrations, etc. Additionally, electric motors for automotive must be fail safe and manufactured in big production lots. A comprehensive contribution from mechanical engineering competences is needed referring to reliability, FMECA, and world class manufacturing paradigms. Advanced testing methods are required for developing new electric motors, either for traction or other purposes. Low and high temperature fatigue loading assessment is needed to cope with extreme missions.

Methods and techniques that will be developed and used to carry out the research

Proper advanced techniques based on finite element modelling will be further improved to tackle the mechanical design problems of electric motors. Contact mechanics, elastic adhesive contact, materials selection, fatigue under varying thermal loads, technological



	constraints, FMECA will be topics to be properly developed referring to a well-defined special design case.
Educational objectives	The Ph.D. candidate will be trained on advanced methods for the design and testing of automotive electric motors. The candidate will learn how to deal with complex design problems, how to define specific KPIs and to properly evaluate them after testing. He/she will learn to manage research as well as to coordinate small research groups. Soft skills like dissemination, communication and outreach management will be taught during the PhD course.
Job opportunities	Structures/organizations aimed at innovation and/or research and technical development, high-tech SMEs, car makers, Tier 1 suppliers. The last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary, compared to Master of Science holders in the same field.
Composition of the research group	1 Full Professors 2 Associated Professors 1 Assistant Professors 2 PhD Students
Name of the research directors	Prof. Roberto Palazzetti

Contacts	
Roberto.Palazzetti@polimi.it phd-dmec@polimi.it	

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

Scholarship Increase for a period abroad	
Amount monthly	566.36 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Funding for educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences); funding per PhD student per year: 2nd



year: euros 1.534 3rd year euros 1.534. Teaching assistantship: availability of funding in recognition of support to 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:** 1st year: individual use 2nd year: individual use 3rd year: individual use. **Desk availability:** 1st year: individual use 2nd year: individual use 3rd year: individual use.