

Additive Manufacturing of Electrical Machines

Summary

Within this thesis, the PhD candidate will learn about the additive manufacturing of electrical machines and design and optimization of special types of electrical machines. We will provide necessary hardware and software for simulation and prototyping the machines but the candidate is responsible for developing design and optimization methodology for novel type machine. At the end of the thesis, several prototype machine will be built and the candidate will participate in this process.

Research field:	Electrical power engineering and mechatronics
Supervisor:	Prof. Dr. Ants Kallaste
Availability:	This position is available.
Offered by:	School of Engineering Department of Electrical Power Engineering and Mechatronics
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

The main tasks of the thesis are:

- Primary design of 3D printed electrical machine
 - Reluctance machine (stepper machine) will be studied and construction of the machine will be selected and designed. The starting point of the design will be defining the nominal parameters of the machine, geometry of the stator and rotor and winding configuration. The machine will be constructed and tested.
- Novel type electrical machine
 - Based on the primary design novel electrical machine construction will be worked out what will take into account additive manufacturing possibilities.
- Design methodology
 - Electromagnetic and thermal design tool will be developed based on the Matlab and using the finite elemental softwares.
- Geometrical optimization
 - After the machines has been designed, the candidate will have to optimize the machines through numerical analysis and optimization procedure.
- Material optimization.
 - The geometrical optimization does not account for the material and other cost. To make the machine attractive for industry applications, the manufacturing and material cost has to be accounted for in a hypothetical series production process. The optimization could be carried out as a multi-objective task.

Within the PhD studies, the candidate will present his/her work in international conferences and publish journal papers required to complete the thesis.



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