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We are looking for a master student to work on

# Parametric Design and Simulation of Electrically-Excited Synchronous Machines

## Background

Permanent magnet synchronous machines are a standard in the automotive sector. In the last years, the variable price of the rare-earth at the base of strong PM push the research on alternative solutions without rare-earth based permanent magnets.

One of the solutions is the Electrical Excited Synchronous Machine (EESM), generally adopted as generator for grid applications and now re-discovered as competitive solution for rare-earth-free traction applications.

The aim of the thesis is to include this kind of motor in SyR-e ([https://github.com/SyR-e/syre\\_public](https://github.com/SyR-e/syre_public)) the open-source design and simulation framework developed in Matlab from PEIC members. At the moment, SyR-e covers other types of electric motor, from Synchronous reluctance motor to interior and surface-mounted permanent magnet motors and induction motor.

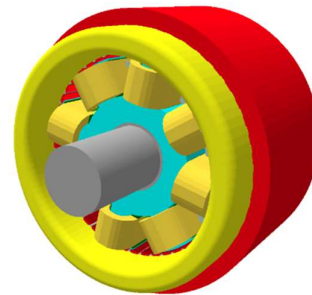


Figure 1 - Example of EESM

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## Your tasks

- Literature review on the design and applications of EESM;
- Geometric parametrization of the rotor geometry in SyR-e, following the adopted code conventions;
- Set up of the Finite Element Analysis (FEA) simulation procedure, adding the field current variable;
- Design comparison of EESM with standard PM-based traction motor.

## Necessary skills

- Knowledge of electrical machines and electric drives
- Basic Matlab programming skills;
- Problem-solving skill;
- Attitude to team-working
- Previous experience in FEA simulation is a plus.

## What you will learn

- To analyze state-of-the-art technical literature;
- The basic principles of electrical machine design;
- How to set up and FEA simulation of electric motor and use the FEA results to estimate the motor performance figures. Software used: FEMM
- To work in a team and cooperating on a common project.

**Duration of the thesis:** 6 months

Dipartimento Energia  
Power Electronics Innovation Center (PEIC)  
Politecnico di Torino



Politecnico  
di Torino



**Application:** We are looking forward to receiving your application. Please include your CV and a short explanation why you fit the position (Italian or English). Send your application to Simone Ferrari ([simone.ferrari@polito.it](mailto:simone.ferrari@polito.it)) and Gianmario Pellegrino ([gianmario.pellegrino@polito.it](mailto:gianmario.pellegrino@polito.it))