



UNIVERSITÀ
DI TRENTO
Dipartimento di
Matematica

DOTTORATO



CYCLE 34th
ORAL DEFENCE OF THE PHD THESIS

Tuesday 17 May 2022 – at 10:00 am
Seminar Room “-1”

The event will take place online through the ZOOM platform.
To get the access codes please contact the secretary office

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PhD Student in Mathematics

Some Optimization Problems in Electromagnetism

Abstract Electromagnetism and optimal control stand out as a topics that feature impactful applications in modern engineering, as well as challenging theoretical aspects of mathematical analysis. Within this context, a major role is played by the search of necessary and sufficient conditions characterizing optimal solutions, as they are functional to numerical algorithms aiming to approximate such solutions. During this seminar I will be discussing three standalone optimization problems that share the underlying framework of Maxwell-related PDEs. First, I will present an optimal control problem driven by a quasi-linear magneto-static obstacle problem featuring first-order state constraints. The non-linearity allows to suitably model electromagnetic waves in the presence of ferromagnetic materials, while the first-order obstacle is relevant for applications in the field of magnetic shielding. Existence theory and the derivation of an optimality system are addressed with an approximation technique based on a relaxation-penalization of the variational inequality. Second, I will analyze an eddy current problem controlled through a dipole type source, i.e. a Dirac mass with fixed position and variable intensity: well-posedness of the state equation through a fundamental solution approach and first order conditions are dealt with. To conclude, I will discuss the computation of the topological derivative for shape functionals constrained to low-frequency electromagnetic problems (closely related to the eddy current model), with respect to the inclusion/removal of conducting material; the results are obtained using a Lagrangian approach.

Supervisors:

Alberto Valli (University of Trento, Italy)

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CONTATTI

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