An introduction to structural shape optimization problems

Professor

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General Information

The course is designed to introduce engineering students to structural shape optimization problems for a continuum in the linear elasticity framework.

The lectures will gradually introduce the main tools one needs to formalize the so-called Hadamard-Céa method. The main topics include a recap of differential calculus, general optimization theory, and of Finite Elements method.

Finally, we will see how to solve numerically the formulated shape optimization problems, comparing the numerical result with the analytical solution, when available.

The lectures will be held in person (Aula Piero Villaggio in the Structural Engineering Division of the DICI Department - University of Pisa, Largo Lucio Lazzarino 1, Pisa) and also online (please send email to marco.picchiscardaoni@ing.unipi.it).

Materials

References and notes will be provided during the course

Schedule

Dates		Description
02/03/2026	14:30 – 17:30	Introduction to vector and differential calculus
09/03/2026	14:30 – 17:30	General theory of optimization
16/03/2026	14:30 – 17:30	Shape optimization problem (1): Hadamard method, shape derivatives of some meaningful functionals.
23/03/2026	14:30 – 17:30	Shape optimization problem (2): Céa formal method
30/03/2026	14:30 – 17:30	Implementation of a numerical code: least compliant cantilever beam for given mass
01/04/2026	14:30 – 17:30	Some more examples: least frequency for a clamped vibrating membrane of given area
		Total 18 Hours – 4.5 Credits

For any information www.indicee.unifi.it - dott-dicea@unifi.it

International Doctorate in Civil and Environmental Engineering