

C1: Theoretical background and basic results

Homogenization and linear and nonlinear PDEs

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1. Short bio:

Manuel Luna-Laynez is Professor in the Department of Differential Equations and Numerical Analysis at the University of Seville. His main research interests concern homogenization theory and asymptotic analysis of partial differential equations posed in thin domains. In particular, he has worked on applications related to the optimal design of materials, fluid behavior in domains with rough boundaries, porous media, and elastic multistructures.

2. Short abstract:

The aim of this lecture is to present fundamental results regarding homogenization theory and to show some of its applications. We will consider a periodic homogenization problem, addressing it using the two-scale asymptotic expansion method and the two-scale convergence method, the latter introduced by G. Nguetseng and developed by G. Allaire. Next, we will examine the homogenization problem for a linear elliptic equation without periodicity assumptions, basing our analysis on the H-convergence framework introduced by L. Tartar and F. Murat. We will see how the results can be extended to monotone operators. Finally, we will present some applications to optimal control theory.