Workshop

Homogenization, spectral problems and other topics in PDE's

Tuesday Feb 2, 2016

Room "Alberto Dou" (209) Facultad de Matemáticas-Univ Complutense de Madrid

9:30-10:15 **Juan Casado Díaz**, Universidad de Sevilla
"A new version of the div-curl lemma and applications"

10:15-11:00 **Pier D. Lamberti**, Università di Padova, Italy
"On Steklov-type eigenvalues for the Laplace and the biharmonic operator"

11:00-11:30 Coffee break

11:30-12:15 **Jaime Ortega**, Universidad de Chile
"Inverse problems in free boundary value problems and related problems"

12:15-13:00 **Patrizia Donato**, Université de Rouen, France
"Asymptotic Analysis of the Approximate Control for Parabolic Equations with Periodic Interface"

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ABSTRACTS

Juan Casado Díaz, Universidad de Sevilla
"A new version of the div-curl lemma and applications"

The div-curl Lemma is a classical result due to F. Murat and L. Tartar. It establishes that for two vectorial sequences converging in L^p and L^q, with p,q conjugated exponents, and such that the divergence of the first one and the curl of the second one converge in a suitable topology, the limit of the product agrees with the product of the limits. It is the most important result of the compensation compactness method, also introduced by the above authors, and has several important applications in the existence of solution for hyperbolic problems, nonlinear elasticity and homogenization theory. Here we get a new version of this result which assumes a lower integrability condition to the two sequences. Namely, now p and q just satisfy 1/p+1/q<1+1/(N-1), with N the dimension of the space. We also need to assume that the product is compact for the weak topology of W^{-1,1}. We apply this result to the convergence of the jacobian and to homogenization.

Pier D. Lamberti, Università di Padova, Italy
"On Steklov-type eigenvalues for the Laplace and the biharmonic operator"

Broadly speaking, an eigenvalue appearing in the boundary conditions of an elliptic operator is an eigenvalue of Steklov-type. In this talk we shall discuss a few variants of the classical second order Steklov problem. In particular, we shall formulate the natural fourth order Steklov problem which involves the biharmonic operator, providing a physical justification. Shape optimization problems will be addressed and an isoperimetric inequality for the first eigenvalue of the above mentioned biharmonic Steklov problem will be presented. We shall also point out that a class of Steklov-type problems could be viewed as a class of critical Neumann-type problems arising in boundary mass concentration phenomena.
This talk is based on joint works with Davide Buoso and Luigi Provenzano.

Jaime Ortega, Universidad de Chile
"Inverse problems in free boundary value problems and related problems "

In the last years, Inverse problems became and interesting area, due to the large number of applications, for example in medicine, mining, earth sciences, oceanography, among others. In this talk we will focus in the study of inverse problems related with fluid mechanics. We will present an identifiability result for water waves and some related problems with the called geometric Inverse problems.

Patrizia Donato, Université de Rouen, France
"Asymptotic Analysis of the Approximate Control for Parabolic Equations with Periodic Interface"

We study the asymptotic behavior of the approximate control for a class of parabolic equations with periodic rapidly oscillating coefficients in composites with a periodic interfacial resistance. We first prove the approximate controllability of the problem as well as the homogenized one, which is a coupled system P.D.E.-O.D.E.
Then we show that the control and the corresponding solution of the periodic problem converge respectively to the control and to the solution of the homogenized problem.