CCSU

DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, May 3
3:00 – 3:50 PM
Room MS 101

HOMOGENIZATION OF PDEs ARISING FROM MODELING OF PHYSICAL PROCESSES IN HETEROGENEOUS MEDIA

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Abstract: In this work, multi-scale analysis is applied to PDEs describing physical processes in heterogeneous media. The existence of heterogeneities causes the fact that differential equations have rapidly oscillating coefficients and can be considered in domains with complex microstructure. This makes both analytical and numerical approaches a challenging task.

Homogenization techniques are aimed to optimize computations by deriving the equivalent macroscopic continuous equations based on micro-scale considerations and predicting the constitutive coefficients.

In this talk we discuss the second order PDEs in materials having a periodic distribution of heterogeneities. We consider existence and uniqueness of the solution of the microscopic problem and its convergence to the solution of the corresponding homogenized problem. We discuss how to derive the homogenized problem and get effective coefficients from the solution of boundary-value problem in the periodic cell.

We present the general approach and discuss the possibility to generalize it taking into consideration nonlinear effects and irregularities of structure. The recent results are illustrated by examples of upscaling the parabolic and hyperbolic equations used to model shale gas transport and acoustic wave propagation through heterogeneous media respectively.

For further information:
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