

Dr. Rita Ferreira

Multiscale Convergence and Reiterated Homogenization in BV

In this talk we are concerned with the description of the macroscopic behavior of a microscopically heterogeneous system. Several approaches have been proposed to handle the minimization of oscillating functionals, such as the method of asymptotic expansions, G-convergence, H-convergence, Γ -convergence and two-scale convergence. In the case in which the microscopic properties of the system are periodic, the method of two-scale convergence has proven to be particularly successful. It was introduced by Nguetseng '89, and further developed by Allaire '92 and by Allaire and Briane '96, and it provides a mathematical rigorous justification for the formal asymptotic expansions that were commonly used in the study of homogenization problems. We will present an extension to the case of multiple well-separated scales of Amar's '98 generalization of the notion of two-scale convergence for bounded sequences of Radon measures with finite total variation. Using such extension, we will provide the characterization of the multiple-scale limit of bounded sequences in the space BV of functions of Bounded Variation. We will also provide the characterization of the multiple-scale homogenized functional associated with first order derivatives homogenization problems with linear growth. Finally, we will present the relation between the multiple-scale homogenized functionals and the respective classical homogenized functionals. This is a joint work with my former Ph.D. co-advisor Prof. Irene Fonseca (CMU).