TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 30 October 2013, 4:00 p.m.

Mathematical Links Between Microstructure and Effective Properties of Composite Materials

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Abstract.

Composite materials are made of homogeneous constituents with different properties. Finely structured two-phase composites occur very often in nature and have wide applications in industry. For example, cancellous bone, water saturated rocks and laminated materials for aircraft. The bulk (effective) properties of a composite material are important in studying the strength and various physical phenomena such as long wave propagation in the composite; they depend not only on the choice of constituents but also on how they are arranged (i.e. microstructure).

In this talk, the mathematical formulation of the forward and inverse problems linking the the microstructure with the effective properties will be presented. The analytical properties of these formulations will be explained through using the theorems in complex analysis and linear functional analysis and numerical results will be given. The history of the study of these problems and its relation to other fields of mathematics will also be presented.