

Department of Applied and Computational Mathematics and Statistics Colloquium

Richard Craster
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will give a lecture entitled:

*Bridging the Scales at High Frequencies: Connecting the Microstructure to the
Macroscale*

Abstract

It is highly desirable to be able to create continuum equations that embed a known microstructure through effective or averaged quantities such as wavespeeds or shear moduli. The methodology for achieving this at low frequencies and for waves long relative to a microstructure is well-known and such static or quasi-static theories are well developed. However, at high frequencies the multiple scattering by the elements of the microstructure, which is now of a similar scale to the wavelength, has apparently prohibited any homogenization theory. Many interesting features of, say, periodic media: band gaps, localization etc occur at frequencies inaccessible to averaging theories. Recently, we have developed an asymptotic approach that overcomes this limitation, and continuum equations are developed, even though the microstructure and wavelength are now of the same order. The general theory will be described and applications to continuum, discrete and frame lattice structures will be outlined. The results and methodology are confirmed versus various illustrative exact/numerical calculations showing that theory captures, for instance, features of topical interest in modern optics such as all angle negative refraction, ultra refraction and localized defect modes.



Monday, November 14th, 2011
4:00 p.m. to 5:00 p.m.
127 Hayes-Healy Center