THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

MATHEMATICS COLLOQUIUM

Functional analytic methods for discrete approximations of subwavelength resonator systems

By

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Abstract

The ability to focus, trap, and guide the propagation of waves is of fundamental importance in physics. Crucially, materials with a small-scale microstructure, known as metamaterials, may exhibit exotic wave properties. We study wave propagation inside metamaterials consisting of high-contrast subwavelength resonators. Using the theory of integral operators, we describe the resonant states of the continuous PDE-problem as the eigenstates of a discrete matrix known as the generalized capacitance matrix. Based on this formulation, we survey a range of important scattering phenomena such as Anderson localization, topological insulators, exceptional points, and Fano resonance. Additionally, we generalize the capacitance formulation to structures whose material parameters oscillate periodically in time. Time-dependent materials have gained recent interest and their analytical and numerical foundation generally remain open. The current formulation provides both theoretical characterization and efficient numerical methods to compute the dispersion relationships of time-dependent subwavelength resonator systems.

Date : 1 September 2023 (Fri)
Time : 3:00pm – 4:00pm
Zoom Meeting : https://hkust.zoom.us/j/98854947680 (Passcode: ustmath)*

All Are Welcome!