

*The AAE Spring 2012 Colloquium Series*

**Adaptive Metamaterials For Wave Steering**

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Professor

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3:00 P.M.

ARMS 1109



**Abstract**

Metamaterials consist of engineered microstructural assemblies that exhibit superior properties in comparison to less-composed or naturally-occurring materials. Their unusual wave properties include band-gap behavior, response directionality, left-handedness, and negative acoustic refraction, among others. These features, and their application for the design of acoustic filters, waveguides, logic ports, and ultrasonic transducer arrays, motivate the investigation of elastic wave propagation in micro-structured media.

The seminar presents in particular the directional properties of periodic media, as defined by their ability to direct waves in preferential direction. Such properties are first illustrated on simple spring-mass systems, and subsequently demonstrated in complex structural lattices operating in linear and nonlinear deformation regimes. In addition, periodic arrays of electromechanical resonators, and lattices that undergo topological changes resulting from structural instabilities are discussed as examples of adaptive metamaterials. Tunable local resonating systems, and local instabilities are investigated as effective means to provide the considered periodic assemblies with adaptive bandgaps and wave steering characteristics.

**Bio**

Massimo Ruzzene is a Professor in the Schools of Aerospace and Mechanical Engineering at Georgia Institute of Technology. He received a Ph.D in Mechanical Engineering from the Politecnico di Torino (Italy) in 1999. He is author of approximately 100 journal papers and about 130 conference papers, and has participated as a PI or co-PI in various research projects funded by the Air Force Office of Scientific Research (AFOSR), the Army Research Office (ARO), the Office of Naval Research (ONR), NASA, the US Army, TRW Corporation, DARPA and the National Science Foundation (NSF). Most of his current and past research work has dealt with structural health monitoring, wave propagation analysis, high frequency vibration modeling, and vibration and noise control techniques. M. Ruzzene is a Fellow of ASME, and member of AIAA, AHS, and ASA.

*An informal coffee & cookie reception will be held prior to the lecture at 2:30 p.m. in the AAE/ARMS undergraduate lounge (directly in front of ARMS 3<sup>rd</sup> floor elevators).*

COLLOQUIUM