

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY-HYDERABAD

“Vibroacoustics of sandwich panels with a lattice core”

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Seminar Abstract

Sandwich panels are extensively used in constructional, naval and aerospace structures due to their high stiffness and strength-to-weight ratios. In contrast, sound transmission properties of sandwich panels are adversely influenced by their low effective mass. Phase velocity matching of structural waves propagating within the panel and the incident pressure waves from the surrounding fluid medium leads to coincidence effects (often within the audible range) resulting in reduced impedance and high sound transmission. Truss-like lattice cores with porous microarchitecture and *reduced* inter panel connectivity relative to honeycomb cores promise the potential to satisfy the conflicting structural and vibroacoustic response requirements. This study combines Bloch-wave analysis and the Finite Element Method to understand wave propagation and hence sound transmission in sandwich panels with a truss lattice core. Three dimensional coupled fluid-structure finite element simulations are conducted to compare the performance of a representative set of lattice core topologies. Potential advantages of sandwich structures with a lattice core over the traditional shear wall panel designs are identified. The significance of partial band gaps is evident in the sound transmission loss characteristics of the panels studied. This work demonstrates that, even without optimization, significant enhancements in sound transmission loss performance can be achieved in truss lattice core sandwich panels compared to a traditional sandwich panel with a honeycomb core under constant mass constraint.

Speaker Biography

A. Srikantha Phani received his PhD in Dynamics and Vibration from University of Cambridge in 2004. At UBC, he leads a combined theoretical-experimental research program, focusing on dynamic response and structure-property relations of lattice materials, structures and devices, using a variety of modeling and simulation methodologies, ranging from atomistic to continuum models. Some of the contributions include: Bloch wave formulation for band gap (phonon transport) analysis in 2D lattice materials, elucidation of band gap formation mechanisms in locally resonant acoustic metamaterials, development of Bloch-Rayleigh procedure for the analysis of the propagation of Bloch waves in damped lattice materials. He delivered invited and keynote research presentations at international conferences in USA and Canada, and invited research seminars in United Kingdom and India. He is the principal editor for a research monograph on Dynamics of Lattice Materials, to be published by John Wiley and Sons. He served on NSERC (Canada) and NSF (USA) committees.

ALL WELCOME