A School of Engineering Seminar

Broadband Vibration Control and Attenuation Using Elastic Metamaterials with Periodic Internal

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(Mechanical Engineering faculty candidate)

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Thursday

1:10-2:00pm

SCI 256

Refreshments will be served – come join us!

Synopsis:

Metamaterials exhibit unique and desirable dynamic properties that are not readily found in nature. They have recently received considerable attention with promising applications demonstrated in acoustic cloaking, efficient vibration attenuation, and elastic wave energy harvesting. Elastic metamaterial structures typically consist of identical cells that are arranged in repeating patterns. Because of this periodic nature, these structures exhibit unique dynamic characteristics stemming from their ability to act as mechanical filters for wave propagation. As a result, waves propagate along the periodic cells only within specific frequency bands. This talk presents a special class of metamaterials where beams and plates house local resonators in the form of small masses suspended on viscoelastic membranes which act as local absorbers of mechanical vibrations. The macroscopic dynamical properties of the resulting periodic structures depend on the resonant properties of substructures. This contributes to the rise of interesting effects such as low-frequency band gaps while maintaining broadband attenuation of propagating waves outside the stop bands due to the presence of a damping constituent. An extension of this work is introduced by incorporating tunable piezoelectric membranes to support the local resonators in an attempt to steer, stop and/or confine the propagation of undesirable external disturbances.

Speaker Bio:

Mostafa Nouh received his M.S. and Ph.D. in Mechanical Engineering from the University of Maryland at College Park. He currently serves as a research associate at the smart structures research center, as well as an adjunct faculty member at the Mechanical Engineering department at the University of Maryland. He has conducted research on topics such as thermoacoustic energy harvesting, dynamics of periodic structures, and active acoustic cloaking. He has published 12 journal papers and co-authored a book chapter in these respective fields.

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