Time & Location: July 7, 2017 at 1:00 PM in HEC 117
Title: Timoshenko Beam Viscous Damping Model for Spacecraft Cabling Dynamics

With the increasing data handling and power requirements of today’s spacecraft, accurately modeling the effects of cabling on spacecraft structural dynamics has become an increasingly important part of the design process. During testing, spacecraft cabling produces a damping effect on the system dynamics; however, current models often overpredict this response in higher frequency modes and produce unrealistic damping values. Previous models incorporated structural and viscous damping terms into Euler-Bernoulli and shear beams; this thesis presents a viscous damping model for Timoshenko beams that can accurately capture the effects of both spacecraft wiring and harnesses during the design phase. Damping in built-up structures shows a weak frequency dependence; therefore, it is of interest to develop a combination of damping terms and coefficients that provide approximately frequency-independent modal damping. Where previous work included a rotation-based damping term to Euler-Bernoulli beam equations to produce frequency-independent damping, this thesis includes higher-order derivative damping terms to characterize their motion. Because Timoshenko beams account for the effects of both transverse shear and rotary inertia, it is of interest to characterize the damping coefficients using these parameters. Finally, deformed beam shapes were studied to further characterize each damping term as a physical dissipative mechanism.

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Approved for distribution by Jeffrey Kauffman, Committee Chair, on June 22, 2017.

The public is welcome to attend.