Time & Location: July 10, 2017 at 2:00 PM in Engineering II 202A
Title: Development and Implementation of a Streamline Process in the Creation and Mechanization of a Negative Poissonâ€™s Ratio Meso-Scale Patterns.

This thesis focuses on the development a streamlined process used to create novel mesoâ€"scale pattern used to induce negative Poissonâ€™s ratio (NPR) behavior at the bulk scale. This process includes, the development, optimization, and implementation of a candidate pattern. Currently, the majority of NPR structures are too porous to be utilized in conventional applications. For others, manufacturing methods have yet to realize the mesoâ€"scale pattern. Consequently, new NPR metaâ€"materials must be developed in order to confer transformative thermosâ€"mechanical responses to structures at high temperature. Additionally, patterns that take into account manufacturing limitations, while maintaining the properties characteristically attached to negative Poissonâ€™s Ratio materials, are ideal in order to utilize the potential of NPR structures. A novel NPR pattern is developed, numerically analyzed, and optimized via design of experiments. The parameters of the mesoâ€"structure are varied, and the bulk response is studied using finite element analysis (FEA). The candidate material for the study is Mediumâ€"Density Fiberboard (MDF). This material is relevant to a variety of applications where multiaxial stresses, particularly compressive, lead to mechanical fatigue. Samples are fabricated through a laser cutting process, and a comparison is drawn through the use of experimental means, including traditional tensile loading tests and digital image correlation (DIC). Various attributes of the elastoâ€"plasticity responses of the bulk structure are used as objectives to guide the optimization process.

Major: Aerospace Engineering

Educational Career:
Bachelor's of Aerospace Engineering, BS, Spri, University of Central Florida

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Approved for distribution by Ali P. Gordon, Committee Chair, on June 20, 2017.

The public is welcome to attend.