MECHANICAL & MATERIAL COLLOQUIUM

A Structural Dynamicist in a Fluids World: Designing Coupled Systems to Advance Aerospace Engineering

by Dr. Jeff Kauffman (University of Central Florida)

Aerospace engineering is inherently multi-disciplinary, driven by maximizing a vehicle's passenger or payload capability. For structural engineers, this objective makes weight-critical designs essential, maximizing strength/weight or stiffness/weight. These designs are ripe for optimization, with coupled aerodynamic, elastic, and dynamic effects. This seminar highlights two recent collaborative projects at the University of Central Florida: drop ejection from millimeter-scale microflyers and high-frequency actuation for jet engine testing. Despite their disparate applications, both projects build on classical structural dynamics and lead directly to fundamental questions in fluid dynamics. At the micro scale, we will investigate how the fluid dynamics of tiny droplets determine their sloshing behavior and ultimately determine how vibrations can be used to remove liquid from critical flight surfaces. Turning to jet engines, we will examine a new way to understand their aeromechanical behavior by designing a high-frequency, high-authority actuator to perturb the engine air flow. Together, these examples illustrate the multi-disciplinarity of aerospace engineering.

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Dr. Jeff Kauffman is an Associate Professor and Associate Chair overseeing undergraduate programs in the Department of Mechanical & Aerospace Engineering. His research focuses on structural dynamics and adaptive structures, emphasizing multifunctional, energy-efficient systems for vibration reduction, structural morphing, and energy harvesting. His NSF-, ONR-, DoD-, NASA-, and industry-funded projects range from high-bandwidth actuators for jet-engine vibration testing to bio-inspired surface decontamination based on mosquito wing mechanics. He earned his PhD and MS from Penn State and a BS from Caltech. Prof. Kauffman teaches mechanics, structures, and vibrations, and values close interaction with students. He advises a diverse group of graduate and undergraduate researchers and is co-director of HYPER, an NSF REU Site in hypersonics that has supported 91 undergraduates since 2019. He is active in AIAA as an Associate Fellow, Chair of the Adaptive Structures Technical Committee, and Deputy Director of the Aerospace Design and Structures Group, and regularly authors the Year-in-Review article for Aerospace America.

Place:
EC 1110

Time:
2:00-3:15PM

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For questions, comments and suggestions, contact Colloquium Organizers Dr. Saja AL Rifai (salrifai@fiu.edu) or Dr. Jiuhua Chen (chenj@fiu.edu)