DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Advanced Computational Modelling for Pristine and Damaged Aerospace Structures: From High-order Sandwich Composite Theories to Quadrature Element Methods"

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Abstract: A sandwich structure typically consists of two stiff thin face sheets separated by a soft low density thick core. This configuration gives the sandwich material system high stiffness and strength with little resultant weight penalty and high-energy absorption capability. The concept of sandwich structures is older than mankind itself, however, it wasn't until World War II that sandwich construction was first used in the famous de Havilland Mosquito bomber, which employed sandwich construction with a balsa core or a birch plywood core. In modern sandwich structures, due to the high divergence in both material properties and geometry between faces and the core, challenges are raised when modelling sandwich structures. The usage of soft core materials and extreme loading conditions result in localized effects, geometry nonlinearity effects, and transverse compressibility effects that are challenging issues and need to be considered.

In this talk, I will first present a nonlinear high-order sandwich panel theory which includes axial rigidity, transverse compressibility, and high-order shear deformation of the core. I will illustrate the geometric nonlinearity effects on the static and dynamic (blast) response, and the buckling and post-buckling behavior of sandwich structures, and describe how we can upgrade this high-order theory to model sandwich panels with interfacial debonds and to obtain fracture mechanics parameters, e.g, energy release rate and mode mixity. Then, I will discuss the Weak Form Quadrature Element Method and its advantages and superiorities in modelling complex aerospace structures. I will conclude my talk by briefly discussing new opportunities in modelling and design novel lightweight structures for aerospace applications by using high-order theories and novel computational methods.

Bio: Dr. Yuan is currently a Postdoctoral Fellow in the Daniel Guggenheim School of Aerospace Engineering at the Georgia Institute of Technology. He obtained his Ph.D. (2017) and Master's (2015) in Aerospace Engineering from the Georgia Institute of Technology. He also earned another Master's in Engineering Mechanics and Bachelor's in Aircraft Design and Engineering in the College of Aerospace Engineering of Nanjing University of Aeronautics and Astronautics in 2012 and 2010. His research interests deal with the mechanics of advanced structures, composite materials and structures, computational methods for high performance computing, structural dynamics, stability, and fracture mechanics.

Date: Thursday, Feb. 20th
Time: 3:30PM
Place: CB 122
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

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