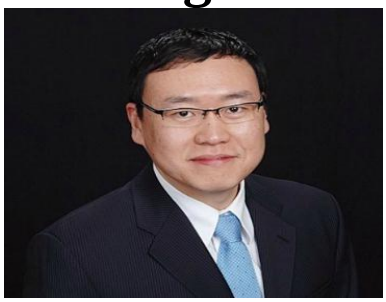
The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



Wooseok Ji

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Lecture Title: Physics-based Progressive Damage and Failure Modeling Tool for Composite Structures Including Uncertainties in Material and Geometrical Properties

Monday, December 3, 2012, 2PM, Room 173 Light Engineering

Abstract

Advanced fiber reinforced polymer composite structures are increasingly used in various engineering applications such as aircraft, automotive vehicles, and marine structures. While many studies have shown the weight specific advantages of composites in structural applications, computational modeling of composite structural response is still an ongoing activity. In particular, there is a strong need to establish and execute accurate prediction models related to structural integrity and damage tolerance (SIDT) of composite structures. An important technical barrier that needs to be overcome in attaining such a goal is the development of a robust and validated physics-based analysis tool that can accurately predict failure initiation and progressive failure of a composite structure incorporating a high level of computational fidelity. For thin laminated composite structures, a predictive computational model is needed for accurately capturing the interaction between in-plane and out-of-plane failure mechanisms. This presentation will highlight the recent development of a unified numerical model for a probabilistic progressive failure analysis (PFA) for advanced composite structures. The PFA is capable of predicting interactive out-of-plane (interlaminar) and in-plane (intralaminar) failure modes observed in fiber reinforced composite laminates. Failure mode interaction is accounted for by implementing a matrix microcracking damage model based on Schapery theory coupled with the discrete cohesive zone model for interfacial failure. A probability analysis model is also implemented to account for uncertainty in modeling parameters and thus to provide reliability-based failure indicators when material variability and manufacturing inconsistencies are considered.

Biography

Dr. Wooseok Ji is a postdoctoral research fellow in the Department of Aerospace Engineering at the University of Michigan Ann Arbor. He received his Ph.D. (2008) and MS (2005) in Aerospace Engineering, both from the University of Michigan, and BS (1999) in Mechanical and Aerospace Engineering from the Seoul National University. After his PhD, he joined the Center for Simulation of Advanced Rockets at the University of Illinois Urbana-Champaign as a postdoctoral research associate (2008-2009) and worked for IllinoisRocstar LLC as a research scientist (2009-2010). Prior to his PhD program, he worked as a tooling engineer for the Aerospace Division of Korean Air (1999-2003). His current research interests are in the fields of computational solid mechanics, multi-physics materials modeling from atomistic to continuum scales, fracture and failure mechanics of composite materials, advanced finite element method, and dynamic instability of composite structures.

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Check http://me.eng.sunysb.edu for any changes to location or time.

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