

seminar

"Predictive Modeling in the Presence of Complexity: Microelectronics Interconnects and 3D Printed Cellular Structures"

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abstract

Models that can reliably predict mechanical properties such as stiffness, yield strength, fracture toughness and fatigue life are essential for critical-to-function parts in a wide range of applications. While standardized test methods and models are well established for homogeneous bulk materials, these approaches are often not valid for several real-world applications due to interwoven complexities of geometry, scale, process dependence and time evolution. Over the past 15 years, my research has focused on developing physics-based models that rely on a combination of analytical, experimental and numerical approaches to make sufficiently accurate predictions in the presence of such complexity, while minimizing computational and experimental expense. This latter fact is vital to increasing the likelihood of adoption of these models by practitioners in industry. In this talk, I shall demonstrate how I developed and validated these models for two different applications: the prediction of fatigue life of solder interconnects in microelectronics devices, and in ongoing work, for predicting the mechanical response of cellular structures made with Additive Manufacturing. I shall close my talk by reviewing some of the current efforts in our state in the growing field of Additive Manufacturing, and discuss the opportunities that I believe lie ahead in the related areas of research collaboration, workforce development and community engagement.

biosketch

Dhruv Bhate is a Senior Technologist at Phoenix Analysis & Design Technologies, Inc. (PADT), an engineering services company in Tempe, where he leads the company's R&D efforts in Additive Manufacturing (AM). His current research is focused on addressing fundamental challenges holding back widespread implementation of cellular structures made with AM in critical-to-function parts, as well as exploring opportunities that lie at the intersection of biomimicry and AM. Prior to joining PADT, Dhruv spent 7 years at Intel Corporation (Chandler, AZ), where he took several laser-based manufacturing processes from early stage research to High Volume Manufacturing in support of Intel's products. Dhruv has a Ph.D. from Purdue University (2008) and an M.S. from the University of Colorado at Boulder (2003), both in Mechanical Engineering. Dhruv co-founded and now co-chairs the Arizona AM Committee, has served as an industry mentor on ASU capstone and honors thesis projects and works closely with students at local high schools on projects that involve 3D printing. Dhruv serves as an instructor and editor in AM for SAE International, and is also the lead author on a new online collaborative textbook on AM for the America Makes organization.

June 2 at 9:00 a.m. in Peralta 135

Seminar is free