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MSEC Seminar and Commercialization Forum

Invited Speaker:

Dr. Mehran Tehrani

"Additively Manufactured Composites:
Mechanics, Materials, and Manufacturing"

November 15th, 2019
1:30 – 3:00 PM
RFM 3224

Biography:

Dr. Tehrani is currently an assistant professor in the Walker Department of Mechanical Engineering at the University of Texas at Austin. Prior to UT Austin, he was an Assistant Professor of Mechanical Engineering at the University of New Mexico. Tehrani's research focuses on advanced multifunctional composites and lies at the intersections of advanced manufacturing, materials science, and mechanics. As such, his team utilizes multi-scale characterization and modeling to understand the structure, mechanics, and physics of interfaces in advanced materials. This understanding is then exploited to develop advanced manufacturing approaches to engineer the interfaces, hence tailoring properties in advanced materials. Tehrani has published his research in some of the highest ranked journals in his field including Composites Science and Technology, International Journal of Plasticity, Carbon, Composites Part B, and Composites Part A. Tehrani's research and teaching awards include the National Science Foundation CAREER award, Office of Naval Research YIP award, Air Force Research Laboratory Summer Faculty Fellowship, Perkin-Elmer Award from the Composite Division at the Society of Plastic Engineers, The College of Engineering Outstanding Doctoral Student at Virginia Tech, and Virginia Tech Entrepreneur Challenge Award.

For more information or if you would like to have lunch with the speaker, please contact Dr. Shannon Weigum at sweigum@txstate.edu

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Abstract:

While polymer additive manufacturing (AM) has advanced significantly over the past few decades, the limitations in material properties, speed of manufacture, and part size have relegated this technology to the space of rapid prototyping rather than the legitimate production of end-use parts. Carbon fiber has been identified as a potential solution to these limitations, as it can improve material properties, reduce the time required to manufacture functional parts over traditional subtractive technology, and reduce warping to lead to a larger build envelope. In this presentation, the effects of carbon fiber reinforcement on the structure and mechanical properties of AM parts will be discussed. From a structural standpoint, additive manufacturing allows for the implementation of specially designed fiber placement within the parts; the fiber orientation will follow the defined nozzle path during the AM process. With a knowledge of the loading profile and failure mechanics of AM composites, parts with unprecedented performance and weight can be designed and manufactured. In this regard, an outlook for the design optimization of AM fiber reinforced parts will be presented. Before the composite AM technology can be matured to meet its full potential, failure mechanics and processing-structure-property relationships in AM composites need to be studied and understood. In this regard, a framework for the failure analysis of AM composites will be presented and their materials science will be discussed. AM composites possess poor inter-laminar properties, significantly limiting their design freedom. Finally, by exploiting the fundamental mechanics of AM composites, scalable and inexpensive approaches for resolving their abovementioned shortcomings are demonstrated

FOR MORE INFORMATION OR IF YOU WOULD LIKE TO HAVE LUNCH WITH THE SPEAKER, PLEASE CONTACT DR. SHANNON WEIGUM AT SWEIGUM@TXSTATE.EDU