

Embedded Tutorial
Thursday March 19 , 9:10 a.m. - 10:10 a.m.

Additive Manufacturing



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Additive Manufacturing (AM) is an emerging field that enables cost efficient manufacturing of complex design features and reduce the number of parts in component assemblies. For thermal management applications, AM can make structures that optimally reduce pressure drop and reform thermal boundary layers in the coolant flow field, reducing the package's overall thermal resistance to incredibly low levels. Emerging design methods such as topology optimization enable physics-led optimization of thermal components. These structures that were once "academic" are now producible. However, there are rules and guidelines that must be followed to ensure that a part is consistently producible. In this tutorial, topology optimization methods will be introduced as a tool for novel conceptual design of components such as heat sinks and heat exchangers. "Rules of thumb" will be presented which will arm attendees with the information they need to make AM work for them in the most efficient way, i.e. building parts right on the first try with no failures, lower surface roughness, reduced overhang requirements, etc. Attendees will learn about the new possibilities of AM and how best to use this technique to exceed performance over conventional manufacturing methods.

Dr. Ram Ranjan is a principal engineer in the Collins Aerospace program office at UTRC. At UTRC, he currently leads multiple programs on advanced design methods, additive manufacturing, and electronics thermal management related to hybrid electric propulsion. He has more than ten years of experience in the field of electronics thermal management and development of CFD tools for various engineering applications. Dr. Ranjan received his Ph.D. in Mechanical Engineering from Pvturdue University in 2011 and his M.S. and B.S. in Mechanical Engineering from the Indian Institute of Technology Kanpur in 2007. He has published his research findings in over 25 publications and has five U.S. patents.