MECHANICAL ENGINEERING SEMINAR

Heat Transfer Design:
From Microelectronics to Thermoelectric Generators to Gas Turbine Cooling

Srinath V. Ekkad

Rolls-Royce Commonwealth Professor
Department of Mechanical Engineering
Virginia Tech

Abstract: Most devices in our world produce excessive heat while providing entertainment, transportation, comfort, etc. Heat transfer design is essential to ensure reliability of working components of nearly all these complex devices. Every problem presents its own challenges and constraints and hence design of the cooling system requires careful consideration in the design process. Each problem has a unique optimized solution based on the given constraints. In this talk, three examples will be presented. First problem will focus on cooling power electronics module for a hybrid electric vehicle where the constraints are based on available engine coolant and the size and complexity of the electronic packaging. Second problem will focus on design of a heat exchanger for a thermoelectric generator that harvests waste heat from the tail pipe of a car. Constraints include space, coolant flow, and manufacturing issues. Finally, cooling of gas turbine blades is a complex heat transfer problem. It involved several mechanisms. We will focus on one design problem involving optimizing a new tripod hole design for film cooling of turbine blades. Results will show unique solutions that we arrived at with our design process that involves both CFD and experiments.

Bio: Dr. S. V. Ekkad is currently Rolls-Royce Commonwealth Professor of Aerospace Propulsion Systems; Director of Rolls-Royce University Technology Center for Advanced System Diagnostics; and Professor of Mechanical Engineering at Virginia Tech. He joined the Mechanical Engineering department at Virginia Tech in August 2007 after 9 years at LSU and 2 years at Rolls-Royce Allison Engine Company in Indianapolis. He received his Ph.D. from Texas A&M University and M.S. from Arizona State University. He has over 20 years of experience in heat transfer related research. He has published over 200 journal & conference articles, two patents and co-authored a book and three book chapters. He currently has funding for over $1.5 million from Siemens, GE Energy, Solar Turbines, Rolls-Royce, NSF, and DOE. Dr. Ekkad has also served as a summer faculty fellow at AFRL, Dayton in 2003. He is well known for his contributions to heat transfer experimental methods. In 2004, he received the inaugural ASME Bergles/Rohsenow Young Investigator in Heat Transfer Award for significant contributions to the field of heat transfer by a researcher under the age of 36. He has received the VT College of Engineering Research Excellence Award in 2012 and the University Alumni Excellence for Graduate Advising Award in 2014. He was recently appointed as Associate Vice President for Research Programs at VT.

Friday, November 14th, 2014
11:00 am Seminar in 233 Mudd
Lunch served at 12:00pm
in MECE Lobby