TEXAS TECH UNIVERSITY
Department of Mechanical Engineering

ME SEMINAR SERIES IN FALL 2013

Tightly Coupled Fluid-Structure Interactions Modeling and Simulations Investigation for Flexible Membrane

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Date: December 2, 2013 (Monday)
Time: 2:00pm-3:00pm
Venue: Livermore 101

Abstract: Modeling and simulations (M&S) of flexible membrane feature complicated physics where the fluid and structural dynamics are governed by a tightly coupled fluid-structure interaction (FSI) mechanism. Such coupling is an inescapable feature of several real life fluid structure interaction problems, e.g., flow-induced vibration of wind-turbine blades and blood flow through artery or deep-veins. Accurate perdition of the FSI behavior of such multiscale multiphysics systems can substantially reduce the costs by reducing the number of experimental investigations needed achieve a necessary design specification or in-depth understanding the complex physics. In this talk, the presenter will present FSI results from a highly flexible membrane – fluid dynamic coupled system. The presenter will highlight modeling challenges such as sensitivities of turbulence modeling and boundary layer separation, convergence of nonlinear iteration loops during tightly coupled fluid-structure interaction, and the scalabilities and robustness of algorithms for High Performance Computing (HPC). The presenter will also address the need for developing a robust and well-designed FSI experimental setup that can provide a detailed fluid flow and structural deformation characteristics under various scenarios.

Speaker Bio: Dr. Kumar has focused his research on understanding the fluid dynamics of complex real life systems with high performance computational methodology in Computational Fluid Dynamics (CFD) and Fluid-Structure Interactions (FSI) using massively parallel computers. Current research topics include developing flow conductance model porous core at pore level to study CO2 sequestration and studying effects nano-particles/coatings on thermal energy storage systems in concentrating solar power, and FSI analysis of blood flow through deep veins. He received B. Tech. from Indian Institute of Technology, Kanpur, India in 1997 and Ph.D. from Rice University, Houston, TX in 2005.