



UNIVERSITY OF NOTRE DAME

AEROSPACE AND MECHANICAL ENGINEERING

365 Fitzpatrick Hall
Notre Dame, Indiana
46556-5637 USA

Telephone (574) 631-5430
Facsimile (574) 631-8341
E-mail amedept@nd.edu
Website <http://ame.nd.edu>

SEMINAR ANNOUNCEMENT

SPEAKER: Dr. Nicholas Zabaras
Materials Process Design and Control Laboratory
Sibley School of Mechanical and Aerospace Engineering
Cornell University
Ithaca, New York

TOPIC: Stochastic Modeling In High-Dimensional Spaces

DATE: Tuesday, January 12, 2010

TIME: 3:30 p.m.

PLACE: 138 DeBartolo Hall

ABSTRACT

To address the curse of dimensionality, reduced-order model representation is needed for both the stochastic input and output of complex physical systems governed by differential equations. To address the high-dimensionality of the system response, we will introduce a High Dimensional Model Representation (HDMR) technique in the stochastic space to represent the model output as a finite hierarchical correlated function expansion in terms of the stochastic inputs starting from lower-order to higher-order component functions. An adaptive version of HDMR is developed to automatically detect important dimensions. Adaptive sparse grid collocation is used to compute the component functions. Stochastic input model reduction is also important. We will briefly review recent progress in model reduction in the representation of random heterogeneous media. Given limited data on the material microstructure, we will show how machine learning algorithms can be used to represent the random microstructures in a reduced space. Examples of flow in random media will be shown for up to 500 random dimensions.