

*Stochastic modeling of multiscale systems*¹

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In the first part of the presentation, we will discuss the development and implementation of stochastic methods for multiscale continuum systems. Two separate stochastic modeling approaches viz. generalized polynomial chaos and a novel support-space approach will be considered in the context of variational multiscale methods. In the former, any stochastic quantity is represented as a sum of its projections on the Askey basis spanning the input probability space. In the latter, a random output is represented in a piecewise finite element representation in the input support space (regions with positive input joint probability distribution). Examples will include the solution of stochastic elliptic equations with multiscale coefficients using a localized stochastic subgrid problem. In the second part of the presentation, we will briefly introduce some stochastic multiscale problems that arise in polycrystal materials. They will include information-theoretic approaches for property prediction of random microstructures and stochastic homogenization techniques.

¹ Invited seminar at the Mechanical Sciences and Engineering department, TAM 500 Series, University of Illinois at Urbana-Champaign, September 28, 2006 (host Prof. J.W Phillips).