TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 19 March 2014, 4:00 p.m.
(tea and social at 3:45)

Efficient Solution Algorithms for Partial Differential Equations with Random Coefficients

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Abstract. We consider new computational methods for solving partial differential equations (PDEs) when components of the problem such as diffusion coefficients are random fields. In recent years, several computational techniques have been developed for such models that offer potential for improved efficiencies compared with traditional Monte Carlo methods. These include stochastic Galerkin methods, which use an augmented weak formulation of the PDE derived from averaging with respect to expected value, and stochastic collocation methods, which use a set of samples relatively small in cardinality that captures the character of the solution space. We give an overview of the relative advantages of these two methods and explore their performance. In particular, we show that for problems in which the dependence on uncertain parameters is linear, the Galerkin systems can be solved efficiently by multigrid methods so that the overall cost of solution is significantly lower than for collocation. We also show that the costs of collocation can be reduced using methods of reduced-order modeling.