This Fall the Division of Applied Math offers a new course

APMA 2811D: Asymptotic Problems for Differential Equations & Stochastic Processes

Instructor: Konstantinos Spiliopoulos (temporary email: kspiliop@math.umd.edu)

Tentative organizational meeting: Tu, Sep 8th, 2009 at 10AM, Room 110, 182 George St. Check first!

- Focus & Topics: Concepts and analytic & probabilistic tools used in various scientific disciplines. Emphasis will be placed on

  1. Asymptotic problems for ODE's and PDE's: approximate solutions of problems that have small (o large) parameters or variables (WKB method, boundary layer theory)
  2. Review of probability theory, introduction to stochastic calculus (Brownian motion, stochastic differential equations, Itô formula, Fokker-Planck eqs, Feynman-Kac formula, relation to PDE's)
  3. Homogenization for PDE's and stochastic processes using various deterministic and probabilistic tools. Homogenization for diffusion in periodic and random media. Averaging for SDE's. Multiple scales method and two-scale convergence.

  The course material will be based on theory, methods and examples from various scientific disciplines.

- Course Objective:

  To learn various analytic and probabilistc techniques which are useful in the analysis of ODE's, PDE's and SDE's that depend on small (or large) parameters and have rapidly oscillating coefficients. To apply techniques from perturbation theory to study homogenization problems for PDE's and SDE's. To derive rigorous proofs of the formal calculations.