

**PDE seminar**  
**University of Minnesota**  
**Wednesday, December 12, 2012**

Speaker: **Wenqing Hu, University of Maryland**

Title: **Second order elliptic equations with a small parameter.**

**Abstract:** The Neumann problem with a small parameter

$$\left(\frac{1}{\epsilon}L_0 + L_1\right)u^\epsilon(x) = f(x) \text{ for } x \in G, \quad \frac{\partial u^\epsilon(x)}{\partial \gamma^\epsilon(x)} \Big|_{\partial G} = 0$$

will be considered in this talk. The operators  $L_0$  and  $L_1$  are self-adjoint second order operators. We assume that  $L_0$  has a non-negative characteristic form and  $L_1$  is strictly elliptic. The reflection is with respect to inward co-normal unit vector  $\gamma^\epsilon(x)$ . The behavior of  $\lim_{\epsilon \downarrow 0} u^\epsilon(x)$  is effectively described via the solution of an ordinary differential equation on a tree. We calculate the differential operators inside the edges of this tree and the gluing condition at the root. Our approach is based on an analysis of the corresponding diffusion processes. Joint work with Professor Mark Freidlin.