1038-65-280   **Hengguang Li*** (`li_h@math.psu.edu`), Department of Math, Penn State Univ., University Park, PA 16802, and **Victor Nistor**. *Applications of the FEM on elliptic PDEs with singular coefficients.*

It is well know that the singular solution of an elliptic boundary value problem may be caused by the non-smoothness of the boundary, changes of boundary conditions, and jump coefficients in the transmission problem. Weighted Sobolev spaces have proved to be a powerful tool for the treatment of these singularities both theoretically and numerically.

Based on the analysis in weighted Sobolev spaces, this talk will discuss some new applications of the finite element method on elliptic equations from physics and engineering, which involve singular coefficients. In particular, equations associated to a Grushin type operator and a Schroedinger type operator will be mentioned. The well-posedness, regularity and Fredholm property of the solution are established in weighted Sobolev spaces, which motivates constructions of special finite element subspaces to cover the quasi-optimal rate of convergence for the numerical solution. In addition, a regularity estimate in these spaces allows us to extend current results to more general Schroedinger type operators from quantum mechanics. (Received February 11, 2008)