Syllabus
Topics in PDE, Math 8590, Fall 2006
Elliptic and parabolic equations in L_p-spaces

Lectures:	14:30-15:20 MWF VinH 206
Instructor:	Nicolai Krylov, VinH 225, tel. 625-8338, krylov@math.umn.edu http://www.math.umn.edu/~krylov
Office hours:	MWF, 13:25-14:15
Textbook:	Lecture notes will be provided
Prerequisites:	Some knowledge of functional analysis, Fourier transform, and integration theory
Final examination:	Take home final due on Friday Dec 15, 2006

The course is intended to cover essentials of the L_p theory of elliptic equations in the whole space as well as in smooth domains with Dirichlet and Neumann boundary conditions. The idea is to make the course self contained, in particular, the Fefferman-Stein theorem concerning sharp functions will be proved.

Five homeworks will be assigned and will form part of the final grade.

Here is an approximate contents of the course:

1. L_2-theory of elliptic equations in the whole space: existense and uniqueness for equations with continuous coefficients, better regularity if the coefficients are smoother.

2. Sobolev spaces W^2_p and embedding theorems: the Gagliardo-Nirenberg, Morrey's, Campanato's, Sobolev-Poincaré, Kondrashov's theorems.

3. Some tools from Real Analysis: sharp and maximal functions, the Hardy-Littlwood and Fefferman-Stein theorems.

3. L_2-theory of parabolic equations with coefficients measurable in t in the whole space: existense and uniqueness for equations with coefficients continuous in x, better regularity if the coefficients are smoother, pointwise estimates of sharp functions of u_{xx}.

4. L_p-theory of elliptic equations with VMO coefficients: in the whole space, regularizer, Dirichlet, Neumann and oblique derivative problems for equations in smooth domains, Dirichlet problem in arbitrary domains.

5. Cauchy problem for parabolic equations with VMO coefficients in L_p and L_q_L_p spaces.

6. Equations in the spaces of Bessel potentials and embedding theorems for them.