MATH 8583/8584: PARTIAL DIFFERENTIAL EQUATIONS

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Time and Location
MWF 10:10am-11:00am, Vincent Hall 207

Textbook
We will use "Partial Differential Equations" by L.C. Evans and "elliptic partial differential equations of second order" by Gilbarg and Trudinger.

Office Hours
Monday 1:00pm-3:00pm, Wednesday 2:00pm-3:00pm

Homework & Grading
There will be homework problem sets, assigned throughout the course.

Description of Course
This is the second semester of the "Theory of PDEs" course. In the first semester, we studied the four fundamental linear partial differential equations, including Laplace, heat, Schröldinger and wave equations using Fourier analysis; went through basic properties of Sobolev spaces; and applied functional analysis tools to prove the existence of solutions to general variable coefficient elliptic equations of second order.

In this semester we will cover the following topics:

- Applications of functional analytic tools to study existence of solutions to general variable coefficient parabolic and hyperbolic equations;
- Improved regularity for the weak solutions obtained from applying functional analysis for elliptic equations;
- Schauder type estimates for elliptic equations;
- De Gegorgi-Nash-Moser theory for elliptic equations, and applications to calculus of variations;
- Nonlinear partial differential equations: a case study of defocusing energy critical wave equations;
- Further topics if time permits: A study of known mechanisms of decay of solutions in partial differential equations, such as those coming from viscosity, dispersion, damping, mixing, and transport and compression.