Syllabus: Math 8583, Theory of Partial Differential Equations

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Office hours: MWF 11:15-12:00; otherwise by appointment.

Course description: This is the first part of a year-long course. After some introductory overview, we will discuss a few results on general PDEs (existence/uniqueness for analytic PDEs and later Fourier transform techniques in constant coefficients PDEs). Our study will then be divided, as the theory of PDEs usually is, into several parts dealing with different types of equations. We will gain some intuition about PDEs of elliptic, parabolic, and hyperbolic types by examining their archetypes: Laplace, heat, and wave equations. We will use various approaches to represent solutions and understand their basic properties. Then we will proceed toward the theory of general linear second order PDEs. As a preparation, we will go through the basics of Sobolev spaces.

Text: L. C. Evans, Partial Differential Equations, 2nd edition; occasionally other sources, as indicated in class.

Prerequisites: Some knowledge of ODEs and Real Analysis (Lebesgue integral, Banach and Hilbert spaces, bounded linear operators) will be assumed.

Grading: The final grade will be determined by two in-class exams (one midterm, one at the end of the instruction period; each exam counts 25% toward the grade) and homework assignments counting 50% (there will be about five assignments). The homework assignments will consist of solving problems; the in-class exams may also involve more theoretical questions (theorems, definitions, examples, their connections, ideas,...). Tentative exam dates: October 26, December 14.