Math 220 – Partial Differential Equations of Applied Mathematics

András Vasy, Autumn 2009: SYLLABUS, AS OF DECEMBER 7, 2009

September 22.	Introduction, classification of PDEs (Strauss 1.1, Evans 1.1-1.3)
September 24.	First order PDEs: characteristics (lecture notes, Strauss 1.2, Evans 2.1)
September 29.	Quasilinear first order PDEs (lecture notes, Evans 3.2, John 1.4-1.5)
October 1.	Distributions (lecture notes, Strauss 12.1, John 3.6)
October 6.	Distributions, weak solutions, shocks (lecture notes, Strauss 12.1, Strauss 14.1, John 3.6, Evans 3.4)
October 8.	Classification of second order equations; wave equation on $\mathbb{R}$ (lecture notes, Strauss 1.5, 2.1, Evans 2.4, John 2.4)
October 13.	The wave equation on $\mathbb{R}$, domain of dependence, propagation of singularities (lecture notes, Strauss 2.1-2.2)
October 15.	Energy conservation for the wave equation; the maximum principle for Laplace's equation (Strauss 2.2-2.3, John 4.2)
October 20.	The maximum principle and energy decay for the heat equation; energy estimates for Laplace's equation; the Fourier transform (Strauss 2.3, 12.3, Evans 4.3.1, with lecture notes)
October 22.	The Fourier transform and solutions of PDE's (lecture notes, Strauss 12.3-12.4)
October 27.	Convolutions, solutions of PDE's by Fourier transform (lecture notes, Strauss 12.3-12.4)
October 29.	Midterm
November 3.	Tempered distributions, convolutions, solution of Laplace's equation and the wave equation in terms of convolutions (lecture notes)
November 5.	Heat and wave equations in half space and on intervals (lecture notes, Strauss 3.1-3.2, John 5.1)
November 10.	Inhomogeneous PDE: Duhamel's principle (lecture notes, Strauss 3.3-3.4, Evans 2.4.2, John 5.1)
November 12.	Separation of variables, eigenvalue problems (lecture notes, Strauss 4.1-4.3)
November 17.	Inner product spaces and symmetric boundary conditions; Fourier series (Lecture notes, Strauss 5.1-5.3)
November 19.	Fourier series (Strauss 5.1-5.5)
December 1.	Convergence of Fourier series (Strauss 5.4-5.5)
December 3.	Laplace's equation on the disk (Strauss 6.3, John 4.3); solvability of PDE by duality (Lecture notes, John 4.5)