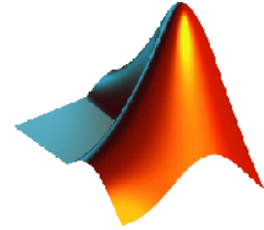


Math 554. Fall 2014.

Linear Analysis & Partial Differential Equations

Prof. Richard Laugesen <Laugesen@illinois.edu>
MWF 12:00-12:50pm



Functional analysis is “linear algebra on infinite dimensional spaces”, such as L^p or Sobolev spaces.

Math 554 develops the modern theory of partial differential equations (elliptic, parabolic, hyperbolic) using concepts of functional analysis, especially weak convergence and compact imbedding in Hilbert spaces. A “hard” core of analytic estimates provides inputs to “soft” structural results from functional analysis. Hence we obtain qualitative information on partial differential equations, such as existence, smoothness, maximum principles and finite speed of propagation, even when the PDEs cannot be solved explicitly.

The course will be valuable to students of differential equations, numerical analysis, probability, and differential geometry.

Background/Prerequisites: Math 541 Functional Analysis is not required. Math 540 Real Analysis and Math 553 Partial Differential Equations are useful, but not strictly required provided you have a strong undergraduate background and are willing to work hard.

Course website <http://www.math.illinois.edu/~laugesen/>

Assessment: Homework 80%, class participation 20%.

Text:

No required textbook. Sources include:

1. G. B. Folland, Real Analysis
2. L. C. Evans, Partial Differential Equations
3. P. D. Lax, Functional Analysis
4. A. Pazy, Semigroups of Linear Operators and Applications to Partial Differential Equations