Math 512 Fall 2007
Partial Differential Equations

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Class Hours: Tu & Th 11:25am-12:40pm in E1 Room 034
Office Hours: Tu & Th 1:30pm- 2:30pm or by appointment

Partial differential equations are effective and useful tools in mathematical modeling of complex processes in engineering and science. This course is especially appropriate for graduate students who would deal with partial differential equations in their research, or who would learn this subject for long term career development.

This course is application-oriented. Examples from applications will be used throughout the course to motivate and illustrate the concepts and techniques.

Not all materials will be presented in class. Students are expected to acquire some of the materials by self-study.

Topics include:

Examples of partial differential equations as mathematical models; first order equations; second order equations; wave equations; Laplace equations; heat equation; numerical simulations via Matlab; linear and nonlinear diffusion equations; strong and weak solutions; well-posedness; Sobolev spaces; fixed point method; method of semigroups of linear operators; partial differential equations models in engineering and science.

Pre-requisites:

Calculus and/or Advanced Calculus; Elementary Ordinary Differential Equations; or Consent of the Instructor

Textbook:

Partial Differential Equations: Methods and Applications. Robert C. McOwen, Second Edition, Prentice Hall, 2003.

Reference Books:

Partial differential equations of mathematical physics, by Tyn Myint-U. Second ed. New York : North Holland, 1980.

Partial Differential Equations, by L. C. Evans, AMS, 1998.

Introduction to Partial Differential Equations, by M. Renardy and R. Rogers, Springer-Verlag, 1996.

An Introduction to Semilinear Evolution Equations, by T. Cazenave and A. Haraux, Clarendon Press, Oxford, 1998.