King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences
(Spring 1999 - 2000)
(Dr. S. Messaoudi)

Course #: MATH 568
Title: Advanced Partial Differential Equations I
Textbook:
1) Partial Differential Equations Methods & Applications by R. McOwen , Second Edition.
2) *Chipot M., Elements of nonlinear analysis*, Birkhuser 2000.

References *Brezis H, Analyse fonctionnelle Theorie et applications,* Second Edition, Dunod, Paris 1999.

Objectives: This course is intended to introduce students to the functional analysis approach and modern theory of solving PDE's and prepare them for further studies in the subject.

Week #	MATERIAL
1	Functional Analysis (Brief) : Introduction to distribution.
2-6	Sobolev spaces : Definitions of $\mathbf{W^{1,p}}$, Extension, embeddings, Poincare's inequality, Dual space.
7	Linear Elliptic Problems :Dirichlet and Neumann Problems, Lax-Milgram Lemma and applications (Laplace's equation)
8	Elliptic Variational inequalities: Generalization of Lax_Milgram Lemma, Applications.
9-10	Nonlinear Elliptic Problems: :A motonocity method, A compactness method, Generalization of variational problems
11-12	Linear Parabolic Problems : Introduction, functional Analysis for parabolic problems, Resolution of parabolic problems, Applications (Heat equation).
13-14	Linear Hyperbolic Problems : Introduction, functional Analysis for hyperbolic problems, Resolution of hyperbolic problems, Applications (Wave equation)
15	Catch Up

Office: 5-315 **Tel**: 860- 4570 **E-mail**: messaoud@kfupm.edu.sa
webpage http://faculty.kfupm.edu.sa/math/messaoud

Grading Policy: HW: 30%, Midterm 35%; Final 35% .

Office hours

	8-8:50	9-9:50	10-10:50	11-11:50	12-12:50	1-1:50	4-4:50
Saturday							
Sunday							
Monday							
Tuesday							
Wednesday							