

King Fahd University of Petroleum and Minerals
 Department of Mathematical Sciences
SYLLABUS
 Semester I, 2006-2007 (062)
 (Dr. Salim Messaoudi)

Course #: Math 696
Title: Reading and Research II (Evolution Equations)
Textbook:

1. Lions J.L., *Quelques methodes de resolution des problemes aux limites non lineaires*, Second Edition, Dunod, Paris 2002.
2. Pazy, *Semi-group atheory*, Academic Press 1975.
3. Brezis H, *Analyse fonctionnelle Theorie et applications*, Second Edition, Dunod, Paris 1999.

References 4. Chipot M., *Elements of nonlinear analysis*, Birkhuser 2000.
Objective This course is intended to expose the students to the theory of maximal monotone operators and their applications in solving some evolution equations arising in mathematical physics. It also opens the route for further advances courses and research in the domains of PDE's.

Week #	Topic
1	Maximum Monotone Operators
2	Solution of an evolution problem
3	Regularity and Self-adjoint case.
4	The Heat Equation: Existence – Regularity – Maximum Principle
5	The wave Equation: Existence – Regularity
6-7	Non-autonomous case: Theorems of Lions
8-9	Nonlinear case: General Existence theorem, Improved existence theorem
10	Applications
11-12	Semi-group theory: Infinitesimal operators, Existence, Regularity,
13-15	Asymptotic behavior: Lemmas of Komornik, Martinez, and Nakao.

Evaluation: Homework + Midterm + Final Exam