

King Fahd University of Petroleum and Minerals
 Department of Mathematical Sciences
SYLLABUS
 Semester I, 2004-2005 (041)
 (Dr. Salim Messaoudi)

Course #: **Lecture Series**
Title: Sobolev Spaces
Textbook: *Analyse Fonctionnelle: Theorie et Applications*, By H. Brezis, Dunod 1999.
Objective This course is intended to expose the audience to Sobolev spaces and some of their applications in solving linear partial differential equations. It also opens the route for further advances courses and research in the domains of PDE's.

Week #	Topic
1	<u>Review of the Lebesgue spaces</u> : Definitions, Properties, Riesz representation theorem (RRT).
2	<u>Sobolev spaces on R</u> : weak derivatives, Definitions, properties
3	<u>Extension and Density</u> : Extension operator, Theorems
4 & 5	<u>Imbedding</u> : imbedding theorems, compact imbedding
6 & 7	<u>The space $W^{m,p}(\Omega)$</u> : Definitions, properties, theorems, Dual space.
8 & 9	<u>Applications to PDE's</u> : Lax-Milgram Lemma, Solution of PDE' s, Regularity.
10 - 12	<u>Sobolev spaces on R^n</u> : Weak derivatives, Definitions, Properties, Extension, Imbeddings, Sobolev inequalities, Trace.
13 & 14	<u>Applications to Elliptic problems</u> : Existence, Uniqueness, Regularity.
15	<u>Catch up ??</u>