

**King Fahd University of Petroleum & Minerals**  
 Department of Mathematical Sciences  
 Course Syllabus  
**MATH 535 [Functional Analysis I]**  
 Term 051  
 (Course Instructor: A.R. Khan)

- Textbook:** W. Rudin, *Functional Analysis*, 2<sup>nd</sup> Ed., McGraw-Hill, 1991.
- References:**
- i. E. Kreyszig, *Introductory Functional Analysis with Applications*, John Wiley & Sons, 1989.
  - ii. C. Groetsch, *Elements of Applicable Functional Analysis*, Marcel Dekker, 1980.
  - iii. B. Bollobas, *Linear Analysis*, Cambridge University Press, 1990.
- Goals:** The main objective of this course is to familiarize our students with basic concepts of functional analysis; it primarily deals with the basics of Banach & Hilbert Spaces. The fundamental results like Hahn-Banach Theorem, Riesz Representation Theorem, Banach Fixed Point Theorem etc. and their applications will be discussed.

**Catalogue**

**Description:** Normed linear spaces, Banach spaces, Hilbert spaces, Banach Algebras (definitions, examples, geometric properties), bounded linear operators, convex sets, linear functionals, duality, reflexive spaces, weak topology and weak convergence, Banach fixed point theorem, Hahn-Banach theorem, uniform boundedness principle, open mapping theorem, closed graph theorem, representation of functionals on Hilbert spaces (Riesz Representation Theorem).

Week	Date	Material
1	Sep 10-14	Metric space; Topological concepts; Examples
2-3	Sep 17-28	Normed spaces; Banach spaces; Examples and Basic concepts.
4	Oct 01-05	Bounded linear operators and their examples
5	Oct 08-12	Finite dimensional normed spaces and subspaces
6	Oct 15-19	Dual spaces; Examples; Banach fixed point theorem
7	Oct 22-26	Hahn-Banach theorem; Consequences and applications
<b>Oct 27, 2005 – Nov 11, 2005: Eid al-Fitr Vacation</b>		
8	Nov 12-16	Continued
9	Nov 19-23	Baire's category theorem and uniform boundedness principle
10-11	Nov 26-Dec 07	Open mapping and closed graph theorems; their applications
12	Dec 10-14	Reflexive spaces; Weak topology and weak convergence
13	Dec 17-21	Inner product spaces; Hilbert spaces; Examples
14-15	Dec 24-Jan 04	Riesz representation theorem; Applications
<b>Jan 05, 2006 – Jan 20, 2006: Eid al-Adha Vacation</b>		
16	Jan. 21	Banach algebras; Examples; Properties

- KFUPM attendance policy will be enforced.
- **Evaluation Policy:** Exams I & II: 20% each; Final exam (comprehensive): 35%, Presentation & Assignments: 25%.