King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

Course Syllabus

MATH 535 [Functional Analysis I]

T252

(**Course Instructor**: *Mohammad Algharabli*)

Textbook: E.S.Suhubi, *Functional Analysis*, Kluwer Academic Publishers, 2003.

References: E. Kreyszig, *Introductory Functional Analysis with Applications*, John Wiley & Sons, 1989.

Main Topics: Normed linear spaces, Banach spaces, Hilbert spaces, Banach algebras (definitions, examples and 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).

Weekly Coverage of Course Material

Week	Date	Material
1	Jan. 11-15	Metric spaces
2-3	Jan. 18-29	Normed spaces and Banach spaces
4	Feb. 1-5	Bounded linear operators
5	Feb. 8-12	Baire's category theorem and uniform boundedness principle
6-7	Feb. 15-26	Open mapping and closed graph theorems
8	March 1-5	Hahn-Banach theorem
9	March 8-12	Topological dual and Reflexive Banach spaces
March 15-26: Eid Al-Fitr Holidays		
10	March29-April 2	Strong and Weak Topologies, and Strong and Weak Convergences
11	April 5-9	Banach Contraction Theorem

12	April 12-16	Inner product spaces and Hilbert
13	April 19-23	Orthogonal Subspaces, Orthogonal Complements and Orthogonal projection
14	April 26-30	Duals of Hilbert spaces: Riesz representation theorem Operators in Hilbert Space
15	May 3-7	Bilinear Forms and Lax-Milgram Lemma

- KFUPM attendance policy will be enforced.

Grading Policy:

- Exam 1: 25%
- Exam 2: 25%
- Homework and other Assignments: 15%
- Final Exam 35% (Comprehensive)

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