

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics and Statistics**  
Math 535-Term 101-SYLLABUS

Instructor: Dr. Abdelkader Boucherif

- Course:** Math 535  
**Title:** Functional Analysis  
**Textbook:** Functional Analysis, Erdogan Suhubi, Kluwer Academic Publishers, (2003)  
**Objectives:** This course is designed to introduce the students to the structures of infinite dimensional vector spaces and transformations, which are frequently called operators, between such spaces. Properties of such spaces that come from the algebraic structures will be discriminated from those which come from topology and ultimately, metrics and norms.  
**Main Topics** Metric spaces, Normed linear spaces, Banach spaces, Banach algebras (definitions, examples and geometric properties) bounded linear operators, linear functionals, duality, reflexive spaces, weak topology and weak convergence, Banach fixed point theorem, uniform boundedness principle, open mapping theorem, closed graph theorem, Hahn-Banach theorem, Hilbert spaces, Riesz Representation Theorem.

**Important information**

Oct. 6	Last day for dropping course(s) without permanent record
Nov. 3	Last day for dropping course(s) with grade of "W" thru Internet
Dec. 12	Last day for withdrawal from <b>all courses</b> with grade of "W" thru the Univ Registrar Office
Jan. 9	Last day for withdrawal from all courses with grade of "WP/WF" thru the University Registrar Office

**Grading Policy**

KFUPM attendance policy will be enforced. Final Exam shall be comprehensive.		
<b>Office:</b> 5-417	<b>Tel:</b> 860- 4194	<b>E-mail:</b> <a href="mailto:aboucher@kfupm.edu.sa">aboucher@kfupm.edu.sa</a>
<b>Grading Policy:</b> Midterm 35%; HW: 25%, Final 40% .		

Week	Date	Section	Topic to be covered (*)
1	Sept.26-28	2.2 2.3 2.4	Linear Vector Spaces Subspaces Linear independence and dependence
2	Oct. 3-5	2.5 2.7 2.10	Basis and Dimension Linear Transformations Linear functionals. Algebraic dual
3	Oct. 10-12	5.2 5.3 5.4	The metric and the metric topology Various metric spaces Topological properties of metric spaces
4	Oct. 17-19	5.5 5.6	Completeness of metric spaces Contraction mappings
5	Oct. 24-26	5.7	Compact metric spaces The Ascoli-Arzela Theorem
6	Oct.31- Nov.2	6.2 6.3 6.4	Normed Spaces Semi-Norms Series of Vectors
7	Nov. 7-9		Banach Algebra- Definition and main properties
			<b>Eid Adha Break Nov. 11-Nov.21</b>
8	Nov. 23-30	6.5	Bounded Linear operators- Principle of Uniform Boundedness- Open Mapping Theorem
9	Dec.5-7	6.8	Equivalent Normed Spaces- Closed Graph Theorem Bounded below operators
10	Dec.12-14	6.9	Continuous linear functionals- Hahn-Banach Theorem Topological dual-Reflexive Spaces
11	Dec.19-21	6.10 6.13 6.14	Strong and weak topologies Conjugate operators- Adjoint Operators Classification of continuous linear operators
12	Dec. 26-28	7.2	Inner product spaces –Properties and Examples
13	Jan.2-4	7.3 7.4	Orthogonal subspaces Orthonormal sets and Fourier series
14	Jan. 9-11	7.5 7.6	Duals of Hilbert spaces- Riesz Representation Theorem Linear operators in Hilbert spaces
15	Jan. 16		Review

(\*): **This weakly coverage is for reference only.** It depends strongly on the pace of the lectures.