MATH 502 – Analysis II
Spring 2024   Instructor: Gökhan Göğüş

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Office hours: by appointment   **Phone:** 9615

This course introduces the methods and language of functional analysis, including Hilbert spaces, Banach spaces, and linear operators on these spaces. This course is part of a two-semester sequence.

Lectures
Monday 15:40-17:30 FENS L048, Tuesday 10.40-11.30 FENS L029

Textbook
Erwin Kreyszig, *Introductory functional analysis with applications*, (1979) Wiley Classics Library, ISBN: 0-471-50731-8
We will cover chapters 1-5 of the book.

Further reading and other reference
J. B. Conway A Course in Functional Analysis
R. E. Megginson Introduction to Banach Space Theory
A. Taylor and D. Lay Introduction to Functional Analysis
P. R. Halmos Introduction to Hilbert Space
P. R. Halmos Hilbert Space Problem Book
W. Rudin Real and Complex Analysis
W. Rudin Functional Analysis
L. W. Baggett Functional Analysis: A Primer
S. K. Berberian Lectures in Functional Analysis
C. W. Groetsch Elements of Applicable Functional Analysis
Dunford and Schwartz Linear Operators (3 Volumes)
Riesz and Sz. Nagy Functional Analysis
K. Yosida Functional Analysis

Course Outline
Metric spaces. Hilbert spaces. Banach spaces. Open mapping and closed graph theorems. Operators on Hilbert and Banach spaces. Duality. Hahn-Banach theorem. Banach-Alaoglu theorem.

Homework. During the semester you will be responsible for homework. All homework should be done individually. Your solutions of homework will be collected, and they will be graded. There is no make up for homework. The best 3 homework out of 4 will count as your homework grade; overall homework is 30% of your total grade. After each homework there will be an oral exam session related to the problems in the homework. You will get 8 percent from the solutions and 2 percent from the oral exam.

Tests/Grading
There will be two midterms, no final exam, 3 homework.

Best 3 Homework	10% each	30%
Midterm 1	April last week	30%
Midterm 2	May 3rd week	40%

Attendance: Students are strongly advised to attend all the lectures.

Makeup Policy
If you miss the midterm, you **must** contact me and explain your excuse as soon as possible. If it is a health problem you must bring your doctor's report, which is given or checked by SU Health Center, as well. In case you are unable to visit me, you, a friend or a relative should somehow (e-mail, phone, etc.) let me know about the situation.

Academic Honesty
I expect you to follow common-sense practices during the exams and all course activities. **Cheating will not be tolerated.** The action against such violations could range from getting a zero on the particular exam to explaining your case in front of the Disciplinary Committee. https://mysu.sabanciuniv.edu/surecharitasi/en

Course Schedule: Roughly these topics will be covered in each week.

Weeks	Section Readings (weekly)	HW/M
1	1.1-1.4 Metric spaces, completeness	
2	1.5, 1.6, 2.1, 2.2 More completeness, normed spaces	
3	2.2, 2.3, 2.4, 2.5, 2.6 Banach spaces, linear operators	
4	2.7, 2.8, 2.9, 2.10 Linear functional, dual space	**H1**
5	3.1, 3.2, 3.3 Hilbert spaces	
6	3.4, 3.5, 3.6 Orthonormal sets	
7	3.8, 3.9, 3.10 Adjoints, normal operators	
8	4.1, 4.2, 4.3 Hahn-Banach Theorem	**M1**
9	4.4, 4.5, 4.6 Reflexive spaces	**H2**
10	4.7, 4.8, 4.9 Uniform boundedness	
11	4.12, 4.13 Open mapping theorem	
12	5.1, 5.2 Banach fixed point theorem	**H3**
13	5.3, 5.4 Applications	
14	Overall Review	**M2&H4**

Add-drop period: February 11-12.
Withdrawal: March 16-April 10.