Math-502 Analysis II

Instructor: Turgay Bayraktar

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Textbook: Erwin Kreyszig, Introductory functional analysis with applications, (1979) Wiley Classics Library, ISBN: 0-471-50731-8.

Supplementary Reading:

- W. Rudin Functional Analysis, Second Ed.
- J. B. Conway, A Course in Functional Analysis
- K. Yosida, Functional Analysis
- R. E. Megginson, Introduction to Banach Space Theory
- Dunford & Schwartz, Linear Operators (3 Volumes)

Lectures: Tue 8.40am-10.30am & Wed 10.40am-11.30am on Zoom
Zoom link: `https://sabanciuniv.zoom.us/j/97410931016`

Content: Metric spaces, Banach spaces, Hilbert spaces. Linear Operators on Hilbert and Banach spaces. Open mapping and closed graph theorems. Dual spaces of normed spaces. Hahn-Banach theorem. Banach-Alaoglu theorem.

Course Policies: Attendance is expected and strongly encouraged. You are responsible for lecture notes, any course material handed out in class. No cell phones, pagers nor laptops are allowed during the lectures. I strongly encourage active participation in the classroom. This way I can clarify the difficulties that you have about the course material.

Grading Policy: There will be bi-weekly homework sets (approximately 5-6 assignments in total) (50%), two online Midterm exams (20% each), participation and an oral exam is worth (10%). The schedule of these exams will be announced on the course website.

Homework: Homework assignments are based on the weeks lectures and will be posted on the SU-course website sometime on Wednesday. That assignment will be due in two week on Wednesday night. You are encouraged to do your homework in groups. You are required, however, to write up your homework on your own. Homework is an essential educational part of this course. Your work will be graded mostly on your ability to work problems on exams. You may have difficulty with solving the problems on midterm exams if you have not practiced the techniques within the

homework problems. If you misuse homework by not doing it yourself, or not checking that you can solve a problem on your own after having been shown how to do it, then your exam scores and corresponding grade will reflect this.

Academic Honesty: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion.

Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the Internet and electronic devices unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse.

In this course, as in many math courses, working in groups to study particular problems and discuss theory is strongly encouraged. Your ability to talk mathematics is of particular importance to your general understanding of mathematics.

You should collaborate with other students in this course on the general construction of homework assignment problems. However, you must write up the solutions to these homework problems individually and separately. If there is any question as to what this statement means, please see the professor or the recitation instructor.

For more information, see the guide on the SU website (`http://mysu.sabanciuniv.edu/yonerge/Akademik_durustluk/E-Investigation.html`).

Tentative course schedule

Date	Sections
Week 1	Metric Spaces (1.1-1.5)
Week 2	Metric Spaces Continued, Normed Linear Spaces (1.6-2.4)
Week 3	Banach Spaces and Bounded Linear Operators (2.5-2.8)
Week 4	Linear Functional and Dual Spaces (2.9-2.10)
Week 5	Hilbert Spaces, Orthonormal Sets (3.1-3.6)
Week 6	Functionals on Hilbert Spaces, Adjoint Operators (3.8-3.9)
Week 7	Bounded Operators on Hilbert Spaces Continued, Normal Operators (3.10)
Week 8	Hahn-Banach Theorem and Applications (4.1-4.4)
Week 9	Reflexive Spaces (4.5-4.6)
Week 10	Uniform Boundedness Theorem, Strong and Weak Convergence (4.7-4.11)
Week 11	Open Mapping Theorem, Closed Graph Theorem 4.12-4.13)
Week 12	Applications: Banach Fixed Point Theorem (5.1)
Week 13	Further Applications (5.2-5.3)
Week 14	Review