Math 501 Real Analysis I
Fall 2023 H.T.K.

Instructor: H. Turgay Kaptanoğlu, SA 124, 290 21 01/
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Office Hours: Any time a student contacts me.

Schedule: Wed. 10:30–12:20, SA 19; Fri. 15:30–16:20, SA 19.

Textbook: *Measure Theory,* 2nd ed., D. L. Cohn, Birkhäuser, 2013, available free with Bilkent IP address at https://link.springer.com/book/10.1007/978-1-4614-6956-8/

Exams and Grading: 50% homework, 25% in-class midterm, 25% in-class final.

Syllabus:

Wk	Dates	Sections to be covered
1	Sep. 14–15	1.1 Algebras and Sigma-Algebras
2	Sep. 18–22	(*Course add/drop deadline, Wed., Sep. 20*) 1.2 Measures 1.3 Outer Measures
3	Sep. 25–29	1.4 Lebesgue Measure 1.5 Completeness and Regularity
4	Oct. 2–6	2.6 Measurable Functions, Complex-Valued Functions, and Image Measures 2.1 Measurable Functions
5	Oct. 9–13	2.2 Properties That Hold Almost Everywhere 2.3 Lebesgue Integral
6	Oct. 16–20	2.4 Limit Theorems 2.5 Riemann Integral
7	Oct. 23–27	(*Sun., Oct. 29, Cumhuriyet Bayramı*) 3.1 Modes of Convergemce 3.2 Normed Spaces
8	Oct. 30 – Nov. 3	(*Withdraw deadline, Wed., Nov. 1*) 3.3 Definition of L^p 3.4 Properties of L^p
9	Nov. 6–10	3.5 Bounded Linear Functionals Urysohn Lemma and Tietze Extension Theorem on $\mathbb{R}^N$ $C_c(\mathbb{R}^N)$, $C_0(\mathbb{R}^N)$, and $L^p(\lambda)$ Lusin Theorem on $\mathbb{R}^N$
10	Nov. 13–17	4.1 Signed and Complex Measures 4.2 Absolute Continuity
11	Nov. 20–24	4.3 Singularity 4.4 Functions of Finite Variation
12	Nov. 27 – Dec. 1	4.5 Duals of L^p Spaces Other Riesz Representation Theorems (statements only) 6.2 Differentiation of Measures
13	Dec. 4–8	6.3 Differentiation of Functions 5.1 Constructions of Product Algebras and Measures
14	Dec. 11–15	5.2 Fubini Theorem 5.3 Applications
15	Dec. 18–20	Catch-up

Final Exams, Fri.–Sat., Dec. 22 – Jan. 6