

## MATH 433 – Fourier Analysis

**Semester:** Spring 2018  
**Instructor:** Burak Gürel  
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**Exams & Grading:** Two midterm tests 30% each and a final examination 40%.

**Course Schedule:** TB 240 **TUE 9:00-10:50**  
 TB 240 **THU 10:00-10:50**

**Office Hours:** TUE and THU 15:00-17:00

**Textbook:** E.M. Stein and R. Shakarchi, *Fourier Analysis: An Introduction* (Princeton Lectures in Analysis, Vol. I), Princeton University Press, NJ, 2003.

Week	Date	Topics	Section
1	2/6-2/8	THE GENESIS OF FOURIER ANALYSIS. The vibrating string and solution to the wave equation. Steady-state heat equation in the disc.	1.1.2, 1.2.1-1.2.2
2	2/13-2/15	BASIC PROPERTIES OF FOURIER SERIES. Main definitions and examples. Uniqueness of Fourier series.	2.1-2.2
3	2/20-2/22	Convolutions. Good kernels. Cesàro means and summation. Fejér's Theorem.	2.3-2.5.2
4	2/27-3/1	Abel means and summation. The Poisson kernel and Dirichlet's Problem in the unit disc. CONVERGENCE OF FOURIER SERIES. Review of inner product spaces. Important examples. Hilbert spaces.	2.5.3-2.5.4, 3.1.1
5	3/6-3/8	Proof of mean-square convergence. A local pointwise convergence result. A continuous function with diverging Fourier series.	3.1.2-3.2
6	3/13-3/15	SOME APPLICATIONS OF FOURIER SERIES. Weyl's Equidistribution Theorem. A continuous but nowhere differentiable function. <b>MIDTERM 1: MARCH 16, FRIDAY.</b>	4.2-4.3
7	3/20-3/22	A continuous but nowhere differentiable function, continued. THE FOURIER TRANSFORM ON $\mathbb{R}$ . Definition of the Fourier transform. The Schwartz space.	4.3, 5.1.1-5.1.3
8	3/27-3/29	The Fourier transform on $\mathcal{S}$ . The Fourier inversion. The Plancherel formula. Extension to functions of moderate decrease. The Weierstrass approximation theorem.	5.1.4-5.1.8
9	4/3-4/5	The time-dependent heat equation on the real line. The steady-state heat equation in the upper half-plane.	5.2
10	4/10-4/12	The Poisson summation formula. Theta and zeta functions. Heat and Poisson kernels.	5.3
11	4/17-4/19	SPRING BREAK	
12	4/24-4/26	THE FOURIER TRANSFORM ON $\mathbb{R}^d$ . Preliminaries and elementary theory of the Fourier transform. <b>MIDTERM 2: APRIL 27, FRIDAY.</b>	6.1-6.2
13	5/1-5/3	Labor Day Holiday: No class on the 1st of May. Radial symmetry and Bessel functions.	6.4
14	5/8-5/10	The Radon transform and some of its applications.	6.5