

# Syllabus for Fourier Analysis

Preparatory course: MATH 5213.

1. Trigonometric Fourier series: Computing expansions, cosine and sine series, complex form
2. Orthogonality: Square integrable functions, Fourier series with respect to an orthogonal system, Schwarz inequality, Bessel inequality, completeness, convergence in the mean
3. Riemann-Lebesgue lemma, Dirichlet kernel, smoothness criteria for convergence of trigonometric Fourier series, localization, Gibbs phenomenon
4. Trigonometric series with decreasing coefficients
5. Completeness of the trigonometric system, Parseval's theorem, integration and differentiation of Fourier series
6. Fast Fourier transform
7. Summability methods for trigonometric Fourier series and consequences
8. Multiple Fourier series
9. Fourier integral, inversion theorem, and consequences
10. Applications to partial differential equations and boundary value problems

REFERENCES: Georgi P. Tolstov, *Fourier Series*. H. Dym and H. P. McKean, *Fourier Series and Integrals*. Albert Boggess and Francis J. Narcowich, *A First Course in Wavelets with Fourier Analysis*. David W. Kammler, *A First Course in Fourier Analysis*.