

The Department of Mathematics

2021–22–A term

Course Name Fourier analysis for Electrical Engineering

Course Number 201.1.9901

Course web page

<https://www.math.bgu.ac.il/en/teaching/fall2022/courses/fourier-analysis-for-el>

Lecturer Prof. Ilan Hirshberg, <ilan@bgu.ac.il>, Office 203

Office Hours <https://www.math.bgu.ac.il/en/teaching/hours>

Abstract

Requirements and grading¹

Course topics

1. Complex valued-functions and the complex exponential. Fourier coefficients of piecewise continuous periodic functions. Basic operations and their effects on Fourier coefficients: translation, modulation, convolutions, derivatives.
2. Uniform convergence: Cesaro means, the Dirichlet and Fejer kernels, Fejer's theorem. The Weierstrass approximation theorem for trigonometric polynomials and for polynomials. Uniqueness of Fourier coefficients. The Riemann-Lebesgue lemma. Hausdorff's moment problem. Convergence of partial sums and Fourier series for C^2 -functions.
3. Pointwise convergence: Dini's criterion. Convergence at jump discontinuities and Gibbs phenomenon.
4. L^2 -theory: orthonormal sequences and bases. Best approximations, Bessel's inequality, Parseval's identity and convergence in L^2 .
5. Applications to partial differential equations: the heat and wave equations on an interval with constant boundary conditions, the Dirichlet problem for the Laplace equation on the disk, the Poisson kernel.

¹Information may change during the first two weeks of the term. Please consult the webpage for updates



Bibliography:

- **Korner**, *Fourier analysis*
- **Stein and Shakarchi**, *Fourier analysis*