

## The Department of Mathematics

2022–23–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/fall2023/courses/fourier-analysis-for-el>

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

### Abstract

### Requirements and grading<sup>1</sup>

### 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.

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<sup>1</sup>Information 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*