Weaver, H. Joseph
Applications of discrete and continuous Fourier analysis. (English) [Zbl 0588.42002]
A Wiley-Interscience Publication. New York etc.: John Wiley & Sons. XII, 375 p. (1983).

Chapter 1 discusses this concept of frequency content of a function from both heuristic and mathematical points of view. Chapters 2, 3, and 4 discuss the Fourier series, Fourier transform, and discrete Fourier transform, respectively. In each of these chapters the basic definition is presented and then the various properties are discussed. The presentations are presented in an analogous fashion so that the similarities of the mappings are highlighted. Chapter 5 presents a discussion of the digital calculation of both the Fourier series and Fourier transform by using the discrete Fourier transform. In this chapter, sampling theory is discussed from a practical point of view. Chapter 6 discusses the concepts of the impulse response and transfer function of a system. These concepts from systems theory are used throughout the remaining applications chapters. The remaining five chapters deal directly with applications to specific fields. Specifically, Chapter 7 discusses application of Fourier analysis to both mechanical and electrical systems as well as the one-dimensional wave equation. Chapter 8 deals with the physics of optical wave propagation and optical systems engineering. Chapter 9 deals with the accuracy of numerical analysis algorithms from a frequency domain point of view. Chapter 10 discusses applications of Fourier analysis to the solution of the heat, or diffusion, equation. Chapter 11 discusses basic applications of Fourier analysis to statistics and probability theory as well as a brief presentation of stochastic systems analysis. This text is based upon a portion of the material that was used as course notes at the University of California's Lawrence Livermore National Laboratory.

MSC:

42-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to harmonic analysis on Euclidean spaces
42A38	Fourier and Fourier-Stieltjes transforms and other transforms of Fourier type
42A16	Fourier coefficients, Fourier series of functions with special properties, special Fourier series
62E99	Statistical distribution theory

Cited in **5** Documents

Keywords:

mechanical system; Fourier series; Fourier transform; discrete Fourier transform; sampling theory; application of Fourier analysis; electrical systems; stochastic systems