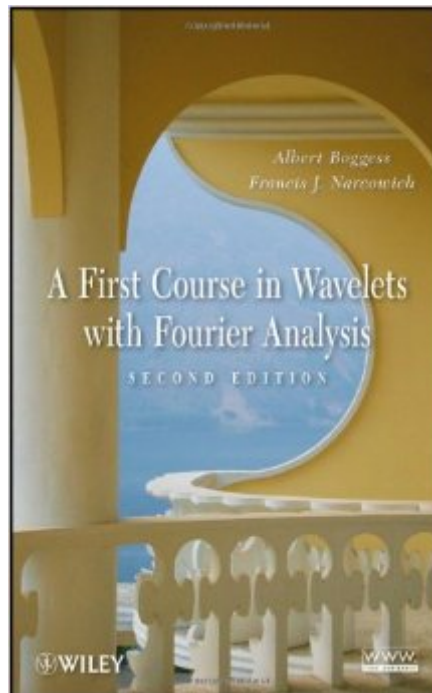


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# A First Course In Wavelets With Fourier Analysis



## Synopsis

A comprehensive, self-contained treatment of Fourier analysis and wavelets—now in a new edition. Through expansive coverage and easy-to-follow explanations, *A First Course in Wavelets with Fourier Analysis, Second Edition* provides a self-contained mathematical treatment of Fourier analysis and wavelets, while uniquely presenting signal analysis applications and problems. Essential and fundamental ideas are presented in an effort to make the book accessible to a broad audience, and, in addition, their applications to signal processing are kept at an elementary level. The book begins with an introduction to vector spaces, inner product spaces, and other preliminary topics in analysis. Subsequent chapters feature: The development of a Fourier series, Fourier transform, and discrete Fourier analysis Improved sections devoted to continuous wavelets and two-dimensional wavelets The analysis of Haar, Shannon, and linear spline wavelets The general theory of multi-resolution analysis Updated MATLAB code and expanded applications to signal processing The construction, smoothness, and computation of Daubechies' wavelets Advanced topics such as wavelets in higher dimensions, decomposition and reconstruction, and wavelet transform Applications to signal processing are provided throughout the book, most involving the filtering and compression of signals from audio or video. Some of these applications are presented first in the context of Fourier analysis and are later explored in the chapters on wavelets. New exercises introduce additional applications, and complete proofs accompany the discussion of each presented theory. Extensive appendices outline more advanced proofs and partial solutions to exercises as well as updated MATLAB routines that supplement the presented examples. *A First Course in Wavelets with Fourier Analysis, Second Edition* is an excellent book for courses in mathematics and engineering at the upper-undergraduate and graduate levels. It is also a valuable resource for mathematicians, signal processing engineers, and scientists who wish to learn about wavelet theory and Fourier analysis on an elementary level.

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## Customer Reviews

At the time of writing of this review (October 2001), a standard academic search procedure reproduces about twenty references per week of scientific papers using wavelet analysis in a very wide spectrum of sciences. More than 160 english language books have been published on wavelets since the first books appeared around 1990. Yet even now it is rare to find a book on this subject which is aiming at undergraduate students and yet is mathematically responsible, without being heavy going. Boggess and Narcovich have tried to do just that, and to my mind have admirably succeeded. Assuming a standard background knowledge in calculus and linear algebra that many science and engineering students acquire in their first two years at university, they present the basics of Fourier analysis and wavelets in eight brief chapters. To prepare the way, they start in chapter 0 with an introduction to inner product spaces, without using advanced analysis, and building on the experience with ordinary vector spaces. Also a sniff of linear operator theory is offered. Chapter 1 introduces Fourier series in real and complex form. These originated in the eighteenth century study of vibrations and in the theory of heat, made famous by Fourier's classic book of 1808: *Analytical Theory of Heat*. The mathematical claims Fourier made, but which he could not all prove himself, gave the impetus to an enormous development of both mathematical theory and applications in all fields of natural science, which is still going on today. The applications briefly mentioned here are denoising and compression of signals, and finding the solution of partial differential equations. Various aspects of the convergence of Fourier series are dealt with.

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