Preface

The classical theory of Fourier series and integrals, as well as Laplace transforms, is of great importance for physical and technical applications, and its mathematical beauty makes it an interesting study for pure mathematicians as well. I have taught courses on these subjects for decades to civil engineering students, and also mathematics majors, and the present volume can be regarded as my collected experiences from this work.

There is, of course, an unsurpassable book on Fourier analysis, the treatise by Katznelson from 1970. That book is, however, aimed at mathematically very mature students and can hardly be used in engineering courses. On the other end of the scale, there are a number of more-or-less cookbook-styled books, where the emphasis is almost entirely on applications. I have felt the need for an alternative in between these extremes: a text for the ambitious and interested student, who on the other hand does not aspire to become an expert in the field. There do exist a few texts that fulfill these requirements (see the literature list at the end of the book), but they do not include all the topics I like to cover in my courses, such as Laplace transforms and the simplest facts about distributions.

The reader is assumed to have studied real calculus and linear algebra and to be familiar with complex numbers and uniform convergence. On the other hand, we do not require the Lebesgue integral. Of course, this somewhat restricts the scope of some of the results proved in the text, but the reader who *does* master Lebesgue integrals can probably extrapolate the theorems. Our ambition has been to prove as much as possible within these restrictions.

Some knowledge of the simplest distributions, such as point masses and dipoles, is essential for applications. I have chosen to approach this matter in two separate ways: first, in an intuitive way that may be sufficient for engineering students, in star-marked sections of Chapter 2 and subsequent chapters; secondly, in a more strict way, in Chapter 8, where at least the fundaments are given in a mathematically correct way. Only the one-dimensional case is treated. This is not intended to be more than the merest introduction, to whet the reader's appetite.

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