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THEORY AND PROBLEMS

of

FOURIER ANALYSIS

with Applications to Boundary Value Problems

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by

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Preface

In the early years of the 19th century the French mathematician J. B. J. Fourier in his researches on heat conduction was led to the remarkable discovery of certain trigonometric series which now bear his name. Since that time Fourier series, and generalizations to Fourier integrals and orthogonal series, have become an essential part of the background of scientists, engineers and mathematicians from both an applied and theoretical point of view.

The purpose of this book is to present the fundamental concepts and applications of Fourier series, Fourier integrals and orthogonal functions (Bessel, Legendre, Hermite, and Laguerre functions, as well as others).

The book is designed to be used either as a textbook for a formal course in Fourier Analysis or as a comprehensive supplement to all current standard texts. It should be of considerable value to those taking courses in engineering, science or mathematics in which these important methods are frequently used. It should also prove useful as a book of reference to research workers employing Fourier methods or to those interested in the field for self-study.

Each chapter begins with a clear statement of pertinent definitions, principles and theorems, together with illustrative and other descriptive material. The solved problems serve to illustrate and amplify the theory and to provide the repetition of basic principles so vital to effective learning. Numerous proofs of theorems and derivations of formulas are included among the solved problems. The large number of supplementary problems with answers serve as a complete review of the material of each chapter.

Considerably more material has been included here than can be covered in most first courses. This has been done to make the book more flexible, to provide a more useful book of reference, and to stimulate further interest in the topics.

I wish to take this opportunity to thank Henry Hayden and David Beckwith for their splendid cooperation.

M. R. SPIEGEL

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