Graduate Texts in Mathematics 85

R.E. Edwards

Fourier Series

A Modern Introduction

Volume 2

Second Edition

Springer-Verlag
New York Heidelberg Berlin

R.E. Edwards
The Australian National University
Department of Mathematics
(Institute for Advanced Studies)
P.O. Box 4
Canberra, A.C.T. 2600
Australia

AMS Subject Classification (1980): 42-01

Library of Congress Cataloging in Publication Data (Revised)
Edwards, Robert E
Fourier series, a modern introduction.
(Graduate texts in mathematics; 64, 85)
Bibliography: v. 1, p. 207–211; v. 2, p.
Includes indexes.
1. Fourier series. I. Title. II. Series.
QA404.E25 1979 515′.2433 79-11932
ISBN-13: 978-1-4613-8158-7 e-ISBN-13: 978-1-4613-8156-3
DOI: 10.1007/978-1-4613-8156-3 AACR2

The first edition was published by Holt, Rinehart and Winston, Inc.

9 8 7 6 5 4 3 2 1

ISBN-13: 978-1-4613-8158-7

PREFACE TO THE SECOND (REVISED) EDITION OF VOLUME 2

Apart from a number of minor corrections and changes, a substantial reformulation and up-dating of Chapters 14 and 15 has taken place. This reformulation and up-dating is a major and very welcome contribution from my friend and colleague, Dr J.W. Sanders, to whom I express my sincere thanks. His efforts have produced a much better result than I could have achieved on my own. Warm thanks are also due to Dr Jo Ward, who checked some of the revised material.

New Sections 16.9 and 16.10 have also been added.

The bibliography has been expanded and brought up to date, though it is still not exhaustive.

In spite of these changes, the third paragraph in the Preface to the revised edition of Volume 1 is applicable here. What has been accomplished here is not a complete account of developments over the past 15 years; such an account would require many volumes. Even so, it may assist some readers who wish to appraise some of these developments. More ambitious readers should consult *Mathematical Reviews* from around Volume 50 onwards.

R. E. E.

CANBERRA, September 1981

PREFACE TO VOLUME 2

The substance of the first three paragraphs of the preface to Volume 1 of *Fourier Series: A Modern Introduction* applies equally well to this second volume. To what is said there, the following remarks should be added.

Volume 2 deals on the whole with the more modern aspects of Fourier theory, and with those facets of the classical theory that fit most naturally into a function-analytic garb. With their introduction to distributional concepts and techniques and to interpolation theorems, respectively, Chapters 12 and 13 are perhaps the most significant portions of Volume 2. From a pedagogical viewpoint, the carefully detailed discussion of Marcinkiewicz's interpolation theorem will, it is hoped, go some way toward making this topic more accessible to a beginner.

A major portion of Chapter 11 is devoted to the elements of Banach algebra theory and its applications in harmonic analysis. In Chapter 16 there appears what is believed to be the first reasonably connected introductory account of multiplier problems and related matters.

For the purposes of a short course, one might be content to cover Section 11.1, the beginning of Section 11.2, Section 11.4, Chapter 12 up to and including Section 12.10, Chapter 13 up to and including Section 13.6, Chapter 14, and Sections 15.1 to 15.3. Much of Chapters 13 to 15 is independent of Chapters 11 and 12, or is easily made so. While severe pruning might lead to a tolerable excision of Section 11.4, which is required but rarely in subsequent chapters, it would be a pity thus to omit all reference to Banach algebras.

I at one time cherished the hope of including in this volume a list of current research problems, but the available space will not accommodate such a list together with the necessary explanatory notes. The interested reader may go a long way toward repairing this defect by studying some of the articles appearing in [Bi] (see, most especially, pp. 351–354 thereof).

The cross-referencing system is as follows. With the exception of references to the appendixes, the numerical component of every reference to either volume appears in the form $a \cdot b \cdot c$, where a, b, and c are positive integers; the material referred to appears in Volume 1 if and only if $1 \leqslant a \leqslant 10$. In the case of references to the appendixes, all of which appear in Volume 1, a Roman numeral "I" has been prefixed as a reminder to the reader; thus, for example, "I,B.2.1" refers to Appendix B.2.1 in Volume 1.

An understanding of the main topics discussed in this book does not, I hope, hinge upon repeated consultation of the items listed in the bibliography. Readers with a limited aim should find strictly necessary only an occasional reference to a few of the book listed. The remaining items, and especially the numerous research papers mentioned, are listed as an aid to those readers who wish to pursue the subject beyond the limits reached in this book; such readers must be prepared to make the very considerable effort called for in making an acquaintance with current research literature. A few of the research papers listed cover developments that came to my notice too late for mention in the main text. For this reason, any attempted summary in the main text of the current standing of a research problem should be supplemented by an examination of the bibliography and by scrutiny of the usual review literature.

Finally, I take this opportunity to renew all the thanks expressed in the preface to Volume 1, placing special reemphasis on those due to Professor Edwin Hewitt for his sustained interest and help, to Dr. Garth Gaudry for his contributions to Chapter 13, and to my wife for her encouragement and help with the proofreading. My thanks for help in the latter connection are extended also to my son Christopher.

CANBERRA, 1967 *R. E. E.*

CONTENTS