WAVES

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WAVES

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Macmillan Education

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Softcover reprint of the hardcover 1st edition 1974 978-0-333-15464-9

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First published 1974 by
THE MACMILLAN PRESS LTD
London and Basingstoke
Associated companies in New York Dublin
Melbourne Johannesburg and Madras

SBN 333 15464 9 (hard cover)
333 16612 4 (paper cover)

ISBN 978-0-333-16612-3

ISBN 978-1-349-15540-8 (eBook)
DOI 10.1007/978-1-349-15540-8

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For Julia, Steven and Jason

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Preface

This book gives an introductory account of the ideas about wave motion and resonance which are important in modern physics, and is based on a course of lectures I have given at the University of Essex for a number of years.

I have tried to emphasise those concepts which are most frequently used at a more advanced level. In particular I have stressed the importance of relating a waveform in time to its frequency amplitude. It is not possible in an introductory text to give a completely mathematical account using Fourier transform theory, but the subject is so important that an early qualitative introduction is called for. The wave equation is given relatively less emphasis than has become usual, and an account of it is deferred until chapter 6. This re-ordering enables one to concentrate on what I feel are more essential matters and to deal with them in a fairly discursive manner. I have not confined the subject matter to classical waves, since the sections on wave-particle duality and the Schrödinger equation have a natural place in a book of this kind.

I have assumed that the reader has a prior knowledge of elementary calculus and trigonometry, and is familiar with the simple harmonic oscillator and a few elementary properties of wave motion. Most students using this book will attend a parallel mathematics course, and I have therefore allowed the mathematical level to drift upwards as necessary in the last two chapters. The book is obviously not a specialist work on optics, acoustics or wave mechanics. However, it should provide a suitable introduction to the courses which a specialist will meet later, and at the same time offer a worthwhile excursion in physics for the student who will later specialise in some other discipline.

To illustrate certain points, a number of worked examples have been included in the text. In addition, there are problems at the end of each chapter, those marked UE being taken from the University of Essex first-year examinations.

I am grateful to many of my colleagues and to my students for their help in contributing ideas and in removing errors. I should like to thank Mr E. Adair for photographic assistance, and Mrs M. Baker for her very capable typing of the manuscript.

D. R. TILLEY