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A Student's Guide to Waves

Waves are an important topic in the fields of mechanics, electromagnetism, and quantum theory, but many students struggle with the mathematical aspects. Written to complement course textbooks, this book focuses on the topics that students find most difficult.

Retaining the highly popular approach used in Fleisch's other Student's Guides, the book uses plain language to explain fundamental ideas in a simple and clear way. Exercises and fully worked examples help readers test their understanding of the concepts, making this an ideal book for undergraduates in physics and engineering trying to get to grips with this challenging subject.

The book is supported by a suite of online resources available at www.cambridge.org/wavesguide. These include interactive solutions for every exercise and problem in the text and a series of podcasts in which the authors explain the important concepts of every section of the book.

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Contents

	<i>Preface</i>	<i>page</i> vii
	<i>Acknowledgements</i>	ix
1	Wave fundamentals	1
	1.1 Definitions	1
	1.2 Basic relationships	6
	1.3 Vector concepts	9
	1.4 Complex numbers	14
	1.5 Euler relations	23
	1.6 Wavefunctions	26
	1.7 Phasor representation of wavefunctions	33
	1.8 Problems	43
2	The wave equation	44
	2.1 Partial derivatives	44
	2.2 The classical wave equation	53
	2.3 Properties of the wave equation	59
	2.4 PDEs related to the wave equation	69
	2.5 Problems	74
3	Wave components	75
	3.1 General solutions to the wave equation	75
	3.2 Boundary conditions	80
	3.3 Fourier theory	94
	3.4 Wave packets and dispersion	116
	3.5 Problems	123
4	The mechanical wave equation	124
	4.1 Properties of mechanical waves	124


4.2	Waves on a string	126
4.3	Pressure waves	134
4.4	Energy and power of mechanical waves	141
4.5	Wave impedance, reflection, and transmission	149
4.6	Problems	161
5	The electromagnetic wave equation	162
5.1	Properties of electromagnetic waves	162
5.2	Maxwell's equations	165
5.3	Electromagnetic wave equation	168
5.4	Plane-wave solutions to the electromagnetic wave equation	171
5.5	Energy, power, and impedance of electromagnetic waves	178
5.6	Problems	184
6	The quantum wave equation	185
6.1	Wave and particle characteristics	185
6.2	Wave-particle duality	189
6.3	The Schrödinger equation	194
6.4	Probability wavefunctions	199
6.5	Quantum wave packets	200
6.6	Problems	213
	<i>References</i>	214
	<i>Index</i>	215


Preface

This book has one purpose: to help you understand the foundational concepts of waves and the mathematics of the wave equation. The authors have attempted to fill the book with clear, plain-language explanations, using just enough mathematical rigor to help you understand the important principles without obscuring the underlying physics. Armed with that understanding, you'll be ready to tackle the many excellent texts that deal with mechanical, electromagnetic, and quantum waves.

You should understand that this book is meant to be used as a supplemental text and is not intended to be a comprehensive treatment of wave phenomena. That means that we haven't attempted to cover every aspect of waves; instead, we've included the topics that our students have found most troubling.

As you'll see, the design of the book supports its use as a supplemental text. Whenever possible, we've made the chapters modular, allowing you to skip material you've already mastered so you can proceed directly to the topics with which you need help. As a Student's Guide, this book is accompanied by a website that provides a variety of freely available material that we think you'll find very helpful. That includes complete, interactive solutions to every problem in the book, as well as a series of podcasts in which we explain the most important concepts, equations, and graphs in every section of every chapter. By "interactive" we mean that you can see the full solution immediately, or you can request one or more hints that will guide you to

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Frontmatter
[More information](#)

viii

Preface

Is this book right for you? It is if you're looking for help in understanding waves, whether you need that help to supplement your work in a physics or engineering class, in preparing for the physical science portion of a standard exam, or as a part of a program of self-study. Whatever your reason, we commend your initiative.

Acknowledgements

Primary responsibility for the good bits in this book belongs to the students in our classes, whose curiosity, intelligence, and persistence have inspired us to pursue (and occasionally find) deeper understanding and better explanations of the physics of waves. We thank those students.

We also thank Dr. Nick Gibbons, Dr. Simon Capelin, and the world-class production team of Cambridge University Press, whose support has been essential during the two-year process that has resulted in this book. The e-book version of this text would not have been possible without the thoughtful guidance of Claire Eudall and Catherine Flack.

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And as always, Dan thanks Jill for her unwavering support and acknowledges the foresight and intuition of Dr. John Fowler, who made possible my contributions to the Cambridge line of *Student's Guides*.