



# Introduction to the Physics of Waves

By Tim Freegarde

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## Introduction to the Physics of Waves By Tim Freegarde

Balancing concise mathematical analysis with the real-world examples and practical applications that inspire students, this textbook provides a clear and approachable introduction to the physics of waves. The author shows through a broad approach how wave phenomena can be observed in a variety of physical situations and explains how their characteristics are linked to specific physical rules, from Maxwell's equations to Newton's laws of motion. Building on the logic and simple physics behind each phenomenon, the book draws on everyday, practical applications of wave phenomena, ranging from electromagnetism to oceanography, helping to engage students and connect core theory with practice. Mathematical derivations are kept brief and textual commentary provides a non-mathematical perspective. Optional sections provide more examples along with higher-level analyses and discussion. This textbook introduces the physics of wave phenomena in a refreshingly approachable way, making it ideal for first- and second-year undergraduate students in the physical sciences.

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#### **Review**

"There are already some excellent textbooks on wave phenomena available, but Freegarde has introduced a helpful new volume that balances brief mathematical derivations with new examples and practical applications. He expanded in a fascinating manner his undergraduate physics lecture notes from the past 15 years. This book will help students to appreciate that understanding wave motion is fundamental to almost every branch of physics. It covers a broad range of wave phenomena in optics, electromagnetism, sound, quantum mechanics, oceanography and other fields. The exercises at the end of each chapter will be useful for instructors and students alike. I recommend it as a textbook for undergraduate students in the physical sciences."

Reva Garg, Instituto de Física, Universidade de Brasília, Brazil for Optics & Photonics News

#### **About the Author**

Tim Freegarde is a Senior Lecturer in Physics at the University of Southampton, where his research explores the use of light to trap, cool and manipulate atoms and particles. He has taught wave related subjects to physics undergraduates of all levels for over fifteen years.

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