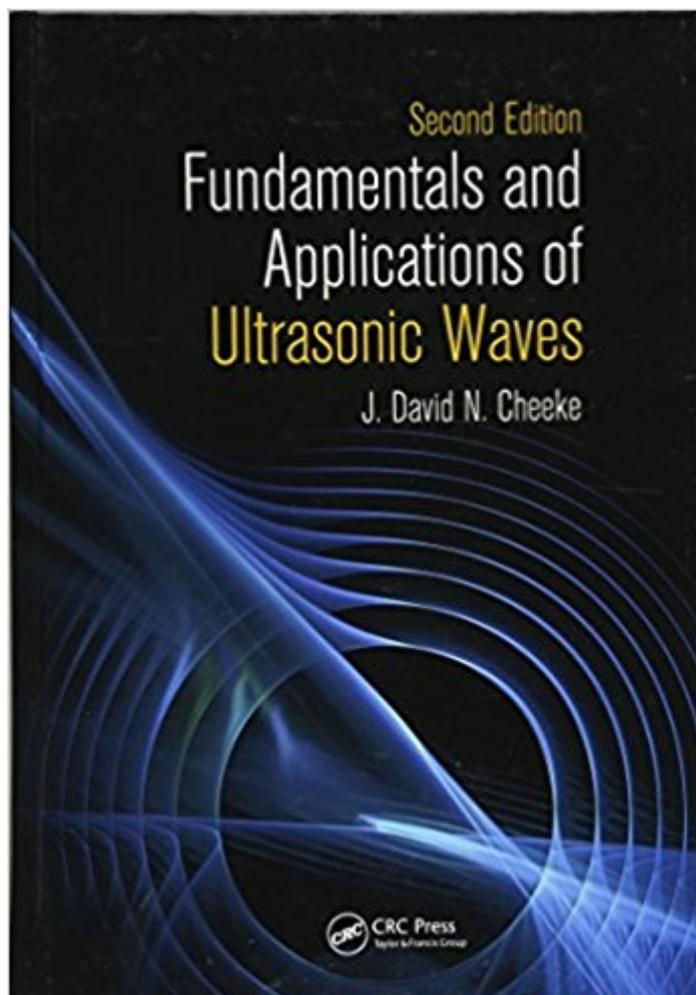


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# Fundamentals And Applications Of Ultrasonic Waves, Second Edition



## Synopsis

Written at an intermediate level in a way that is easy to understand, *Fundamentals and Applications of Ultrasonic Waves, Second Edition* provides an up-to-date exposition of ultrasonics and some of its main applications. Designed specifically for newcomers to the field, this fully updated second edition emphasizes underlying physical concepts over mathematics. The first half covers the fundamentals of ultrasonic waves for isotropic media. Starting with bulk liquid and solid media, discussion extends to surface and plate effects, at which point the author introduces new modes such as Rayleigh and Lamb waves. This focus on only isotropic media simplifies the usually complex mathematics involved, enabling a clearer understanding of the underlying physics to avoid the complicated tensorial description characteristic of crystalline media. The second part of the book addresses a broad spectrum of industrial and research applications, including quartz crystal resonators, surface acoustic wave devices, MEMS and microacoustics, and acoustic sensors. It also provides a broad discussion on the use of ultrasonics for non-destructive evaluation. The author concentrates on the developing area of microacoustics, including exciting new work on the use of probe microscopy techniques in nanotechnology. Focusing on the physics of acoustic waves, as well as their propagation, technology, and applications, this book addresses viscoelasticity, as well as new concepts in acoustic microscopy. It updates coverage of ultrasonics in nature and developments in sonoluminescence, and it also compares new technologies, including use of atomic force acoustic microscopy and lasers. Highlighting both direct and indirect applications for readers working in neighboring disciplines, the author presents particularly important sections on the use of microacoustics and acoustic nanoprobe in next-generation devices and instruments.

## Book Information

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## Customer Reviews

It balances elementary introduction and advanced application; his discussion of advanced application extends to current research in theoretical and experimental ultrasonics. Whenever possible Cheeke uses qualitative models to elucidate complex concepts he has derived mathematically but whose full physical implications may be opaque to the neophyte. In introducing ultrasonic measurement techniques, he enumerates the steps and methods -- and also the pitfalls that await the unsuspecting novice. -- Physics Today, April 2003 --This text refers to the Paperback edition.

J. David N. Cheeke received his bachelor's and master's degrees in engineering physics from the University of British Columbia, Vancouver, Canada, in 1959 and 1961, respectively, and his Ph.D in low temperature physics from Nottingham University, United Kingdom, in 1965. He then joined the Low Temperature Laboratory, CNRS, Grenoble, France, and also served as professor of physics at the Université de Grenoble. In 1975, Dr. Cheeke moved to the Université de Sherbrooke, Canada, where he set up an ultrasonics laboratory, specializing in physical acoustics, acoustic microscopy, and acoustic sensors. In 1991, he joined the physics department at Concordia University, Montreal, where he was head of an ultrasonics laboratory. He was chair of the department from 1992 to 2000. In 2003 he retired from Concordia University and became Vice President, Operations, of Microbridge Technologies, Inc., Montreal, a spinoff from Concordia University. He retired from Microbridge in 2006 and has lived in Victoria, BC, since that time. He has published more than 150 papers on various aspects of ultrasonics and acoustics. He is a senior member of the IEEE.

Fundamentals and Applications of Ultrasonic Waves, one of the most current books on this subject matter to be widely available within the past few years, attempts to go from the basics of acoustics and ultrasonics through acoustic devices and applications to a few specialty topics towards its conclusion. While it does contain plenty of information and elucidates some topics that may be difficult to find in similar works it has unfortunately missed the mark with respect to a most important consideration--the reader. The fact that this is a first edition is more than obvious not only in that the presentation is questionable but that the writing style ranges from sub-standard to okay--attributes

which make for an odd juxtaposition when compared with the author's credentials and experience. The writing does not deliver on the promise of clear, engaging prose as stated on the back cover. So much so that one must pause to wonder whether or not this book had been proof-read before going to final print. Nonetheless, the topical information is indeed given. The caveat is that the reader will have to practice patience and decipher the, at times, convoluted writing so as to get to central ideas. In terms of its presentation, there is no clear indication as to the division between fundamentals and applications in the text. Accessibility for the reader could have been increased by a more sectioned approach to the chapters and their subsections that delineated such divisions. Another problem is that a significant number of the chapters seem to err on the short side in terms of length. That may not seem like a significant problem, but when you take into consideration the many cross-references given in the text to other works on points that are only briefly introduced within the discourse it is easy to see where comprehensiveness can be lost. For the student there are some chapter summaries and questions. These are only given for chapters 2 through 10. The reader is not given any indication as to why the rest of the chapters do not deserve the same treatment. As given, the summaries represent more of a glossary to be placed in an appendix rather than clear summarizations for their respective chapters--they have no apparent order either. Answers for the chapter questions are not available. There is no information in the text pertaining to the availability of question answers for course instructors or students alike. By such unavailability the text does not lend itself well to adoption as a course text by educational institutions. As stated in the book, university courses in ultrasonics are usually only available to upper level graduate students. Currently there are few university physics departments that give these courses. One of the author's purposes in writing this book is to fill this void and make available a book for beginning graduate students or newcomer's to this field. Though while covering many topics this book does little to improve the accessibility of the subject. Most of the basic chapters near the beginning of the text can be found in any text on acoustics, vibrations, or waves. Nothing special about them. Whereas, some of the more particular later chapters on the subject at hand appear to be more of a compilation of research results than of thoughtful discourse. This may partially explain the lack of chapter questions for the later chapters. The overall sense is that this is more of a patch work than a smoothly connected edition. Hopefully this work will go through a thorough revision before it ever makes it into a second edition. It is not enough to just fill a volume with details. Those details must be thoughtfully drawn together to conveying rhythm and flow to the subject. In the end, this text serves better as a reference than as a course text.

I found this book useful when TEACHING a course on ultrasonics, but I would never use it as a classroom text or as reference from which to learn on your own. The reasoning behind this is that the book quite simply covers too many topics to go into details. It therefore provides only a summary of results and applications, and rarely delves into the details of derivations or the intricacies of various scientific principals encountered during these derivations. Cheeke's book does, however, provide excellent insight into applications of ultrasonics and a tremendous number of useful references of original scientific work. The book provides the reader with a survey of the breadth of topics related to ultrasonics in one source together with the pertinent equations and their applications. I found this aspect of the book useful when providing a backdrop for fundamental topics being taught in the course.

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