



## Book review: Acoustics for Engineers: Troy Lectures (3rd Edition)

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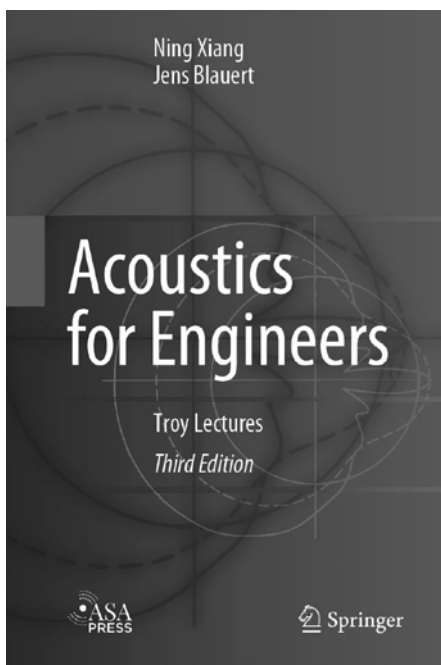
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# Book reviews



## **Acoustics for Engineers: Troy Lectures (3rd Edition)**

**Ning Xiang and Jens Blauert**

**Springer Nature, Berlin, 2021**

**Jointly published with ASA Press**

**421 pages**

**Hardback, eBook**

This revised edition of *Acoustics for Engineers* presents a textbook introduction to acoustics at the graduate level. The book comprises 13 main chapters, in addition to an introduction, solutions to chapter exercises, and appendices including a recommended list of supplementary textbooks. These chapters are short and concise, well-suited to help instructors formulate lecture courses. When introducing new concepts to the reader, the authors frequently employ real-world rather than highly theoretical presentations. This approach is especially beneficial to engineering students who may prefer to learn from “hands-on”-type experiences. However, on many instances, such introductions are rather brief, potentially limiting the suitability of this text for self-study.

Although not explicitly subdivided, the book appears to be organized into three basic sections. The first section, chapters 2–6, could be considered fundamentals of acoustics and transduction from the perspective of an electrical engineer. The second section, in chapters 7–11, presents acoustic fundamentals concerning propagation from a physical perspective. Lastly, chapters 12–14 make up the third section, which introduces room and building acoustic fundamentals and the basics of noise control from an acoustic engineering perspective.

In more detail, the chapters and lectures are organized as follows. The introduction in chapter 1 establishes basic acoustic terms and definitions, such as sound speed, sound level, and frequency intervals, among others. The substance of the book begins in chapter 2 with a discussion of mechanical vibrations and a short derivation of the mathematical equations that describe them. Chapter 3 introduces the electrical equivalency circuits and lumped-element representation related to acoustic phenomenon. Chapters 4–6 then go on to introduce electro-acoustic fundamentals and lumped element electronics of various transducer types (microphones and speakers). The book shines in providing these electrical circuit analogies of mechanical and acoustic systems and in its explanations of transduction. In particular, chapter 3 is very well organized and presents valuable information that is used in the majority of the upcoming chapters. The chapter presents both the force-current and force-voltage electrical circuit analogies, which each have their respective uses throughout the text. Although the distinction between two-port and three-port components in chapter 4 could be better explained, because these are not always included in basic circuit analysis classes for engineering students, we appreciate the use of real-life applications and devices to explain the fundamental concepts of transduction. Chapters 5 and 6 also dive right into the exact details of other devices, which is extremely useful

for students interested in pursuing careers in designing transducers. However, the succinct presentations leave one somewhat craving more material. On many occasions, the inner workings of a device are thorough, but the description lacks information on why certain engineering decisions were made in the creation of the transducers. The text could be improved with the inclusion of the context behind the engineering choices.

Chapter 7 introduces the one-dimensional wave equation in fluids, followed by chapter 8, which extends one-dimension propagation to ducts and horns. Chapter 8 in particular makes good use of the circuit analogies formulated in earlier chapters to analyze horns and ducts, which could readily be applied to real-world engineering applications. Chapter 9 broaches three-dimensional propagation and the notions of sound power, spherical harmonics, line arrays, and directivity. Such notions are then brought together in chapter 10, in which baffled pistons and vibrating membranes are introduced. Chapter 11 concerns energy loss mechanisms and reflections. This section provides a good derivation of the wave equation (chapter 7) that is easy to follow for both instructors and students. However, the organization of chapters 7 and 11 is perhaps not the clearest. For example, the explanation of impedance tube measurements is included in chapter 7 without much context.

Chapter 12 presents a rapid overview of room acoustics principles, including the analogy of geometrical acoustics. Chapter 13 then presents fundamental concepts of building acoustics, such as bending waves and plates, as related to sound transmission. Chapter 14 then concludes with various points regarding noise control, including basics of outdoor sound propagation. Although these chapters introduce such concepts, this section may not provide sufficient detail to either students interested in engineering acoustics or those who wish to study room acoustics. An instructor would be more likely to go straight to the references mentioned in chapter 16 than to rely on this section.

Following these lecture chapters, each of which includes a series of problems for the student to solve, chapter 15 contains the solutions to the proposed problems. It is this significant chapter, representing more than a third of the book's volume, that the student is presented with not just the solution to each problem but also a methodical step-by-step approach to each solution. This walk-through of each solution is one of the most significant contributions of this text to the plethora of acoustic textbooks on the shelves. The solutions provide a type of teaching assistant to the young graduate student, helping them develop the problem-solving skills and techniques associated with acoustic fundamentals. They are well-done and thorough and are a great asset compared with the book's second edition.

Although this book could be useful in developing oral lectures for an introductory acoustics course, this text does not seem

appropriate for self-study because various concepts are introduced only briefly, lacking context and clear descriptions. For example, chapter 1 introduces the concepts of field, mechanical, and acoustical impedance but never really defines the term impedance or provides context for why quantities of pressure (or force) over velocity are important. Impedances are used throughout the book in which contexts to specific applications are provided, but it is never explained why we measure such quantities. Despite these shortcomings, the information contained in the text is useful and relevant.

Although the organization of the lecture chapters appear well-suited to students already familiar with basic electronic concepts, those coming from other undergraduate disciplines could be more inclined to alter the order of the chapters, beginning with more acoustic propagation fundamentals before approaching transducer

elements. Knowledge of basic fundamentals of differential equations are required, which should be suitable to those with an undergraduate engineering degree or those attending first-year graduate-level mathematics courses in parallel.

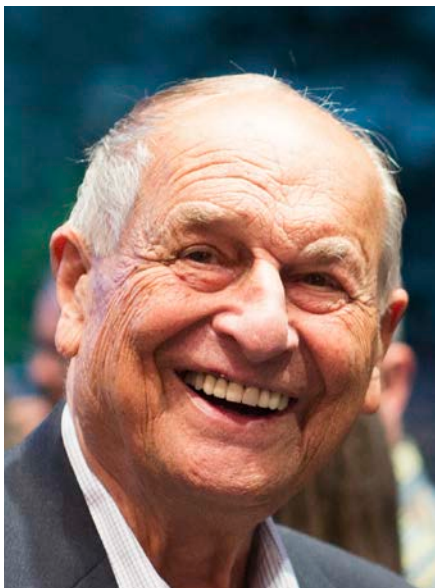
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## Obituaries



On June 25th, 2022, Jiri Ocenasek, AES Life Member, passed away. He lived his life with music and family.

Jiri's passion with recording music started in his teens in a private recording studio that mixed music for the figure skating competitions he took part in. In this Prague recording studio in Czechoslovakia, he learned to use the mixing console and cutting turntable and soon was asked to join the same studio as a technician while

continuing his education. After the nationalization, the recording studio became part of the Czech governmentally owned recording industry. Jiri spent his entire career working for the company, producing on the SUPRAPHON label as a recording engineer in the classical music department. He specialized mostly in recording and mixing chamber music, symphonic music, folklore, and drama. In later years, he became a sought-after expert in restoration of archived production. The credits for his work appear on sleeve notes of hundreds of recordings from old 78 r/min to LP in mono, stereo, quadrasonic, and finally digital recordings under the SUPRAPHON label. He worked closely with the company-owned pressing factory to ensure the quality of the end product and managed the sales department producing custom recordings for domestic and foreign customers. His job led him to visit recording studios and producing factories in Germany, Switzerland, Russia, Poland, and Hungary.

His professional success and lifetime achievements in the recording industry led him to join the AES during its 1984 Convention in Paris, and he became a regular participant at AES Conventions. He was one of the founding members of the Czech AES section and later helped in setting up the Czech student section. He devoted over 18

years of his life to the members and students of the Czech sections as an officer and shared his expertise in numerous meetings, conferences, and written articles. It is mostly due to his hard work and efforts that the Czech section of the AES became a vital member of the AES organization. In 2009, the year of his 81st birthday, Jiri received the Board of Governors Award for his dedicated service to the Czech AES Section, for which he worked for many years as Secretary and Treasurer.

**Libor Husnik**

*AES Czech Section  
Czech Technical University in Prague*

