Engineering Acoustics
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Engineering Acoustics is a comprehensive introductory noise control textbook. The content should be understandable to most people with an undergraduate engineering degree. It is especially appropriate for graduate courses in noise control. It is designed and written to introduce readers to the basics but progresses on to more advanced noise control topics. Hence, two semesters are likely needed to cover all the material in the book. The most comparable book is *Engineering Noise Control* by Bies, Hansen, and Howard which is now in its 5th edition. *Engineering Acoustics* covers similar ground, but organization and emphases are different.

The authors are Malcolm Crocker and Jorge Arenas. Crocker is a professor emeritus at Auburn University who has been at the forefront of the noise and vibration field for over 50 years. He has authored and edited numerous books over that time including handbooks and encyclopedia on noise control and acoustics. Moreover, he has numerous former students who are still active (or retired) including co-author Jorge Arenas. Arenas is a professor at Austral University of Chile and is similarly well known for his research in noise control. As one reads the book, the depth of knowledge and practical experience of the authors is evident.

Chapter 1 introduces the field of noise control and includes useful sections on frequency analysis and signal processing. The essentials of structural vibration are covered in Chapter 2 including sections on beams and plates.

With that background out of the way, Chapter 3 covers acoustic basics such as wave motion, standing waves, directivity, and decibels. It deals with various introductory acoustics concepts such as the direct and reverberant fields, and reflection, diffraction, refraction, and scattering. Although Chapter 3 covers a great deal of ground, explanations are detailed and clear. The authors elect to dispense with a derivation of the wave equation instead describing the equation intuitively and focusing on its solution.

Chapters 4, 5, and 6 look at human hearing, effects of noise, and methodologies to evaluate the human response to noise. These three chapters are welcome since these topics are frequently given short shrift in other engineering noise control textbooks. The authors explain concepts such as loudness, masking, and bark in detail. They consider the effects of noise such as annoyance, sleep disturbance, and hearing loss and even include a section on whole body vibration. They then consider human response metrics like articulation index, speech interference level, noise criterion curves, and day-night equivalent sound pressure level.

Chapter 7 describes the various vibration and acoustic transducers and does the job well. This paves the way for Chapter 8 on sound intensity and sound power. The authors skillfully bring the reader up to date on the history of sound intensity measurements and emphasize the usefulness of sound intensity. This is not surprising since Crocker was one of pioneers of sound intensity measurement. The chapter concludes by looking at several practical examples that demonstrate how the method can be utilized to solve noise control problems. In summary, the chapter on sound intensity is the best I have read and will provide long-term benefit to noise control engineers.

The authors then describe different methods for noise control. Chapter 9 includes sections on vibration isolation, structural damping, sound absorptive materials, full and partial enclosures, barriers, and active noise control. The section on enclosures is particularly helpful. Chapter 10 looks at the use of mufflers and silencers. This is another detailed chapter that surveys the pioneering work by Davis, Crocker, Prasad, Sullivan, and many others. This is another chapter which will provide significant long-term value to noise control engineers.

The final third of the book looks at noise control in different industries. For example, Chapter 11 looks at the noise from gears, fans, motors, and pumps. Chapters 12 and 13 focus on building and HVAC noise respectively. These chapters include detailed discussions on mass law, energy models, plenum silencers, isolation of large equipment, and other topics. Chapters 14 and 15 deal with transportation noise. Chapter 14 looks at vehicle, train, and ship noise, and Chapter 15 discusses airplane, helicopter, and airport noise. Chapter 16 considers how vehicle, rail, and aircraft noise impact a community.

There are some other notable features of the book. First, the reference lists at the end of each chapter are very complete and will prove useful for anyone looking to delve further into a topic. I was made aware of many important and useful references as I reviewed the book. Second, there are example problems scattered throughout. Most of these problems are short and applied examples that are ideal for training the new noise control engineer. Third, the book has numerous figures and plots to supplement the text. The layout is attractive and easy to peruse. Fourth, the book is ideal for someone studying for a noise control professional examination. The coverage of the field is reasonably complete, the organization of the material is natural, and example problems

are like what might be expected. In conclusion, this is a much-needed textbook that is on par with the best noise control books. Going forward, I believe that it will be one of the first books that noise control specialists turn to.

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