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Book Reviews

Acoustic and Electromagnetic Waves, by D. S. Jones. Oxford University Press, New York, 1986. 745 pages. Price: $145.00.

REVIEWED BY J. D. ACHENBACH[1]

Acoustic and electromagnetic wave motions are governed by essentially the same equations, and the same mathematical techniques are used to solve wave propagation problems in the two fields. This book discusses the common features of methods to analyze the two kinds of wave motion. Where necessary it draws attention to differences, which may be due to different boundary conditions or due to polarization effects of electromagnetic waves.

This is a book for the advanced reader, who has had exposure to the basic material. The book is some 700 pages long, but it seems to contain the information of a volume twice that length. The material is presented in a very concise form, little detail is offered. Typically the author states a problem and a few steps in the solution process, then he gives the expression for the solution and concludes with a brief discussion. This reviewer would have liked to see a larger list of selected referneces for the details of the mathematical developments and for related work. The number of relevant publications in the areas covered by this book makes anything resembling complete referencing totally impossible, but the author has gone to the other extreme of including a very short list.

The first two Chapters are general in nature. Chapter 1 deals with the general properties of solutions of the equations governing acoustics and electromagnetism in matter which has certain macroscopic properties. Chapter 2 deals with relativistic effects. The remainder of the book is primarily concerned with solutions to specific problems. Chapter 3 deals with radiation, and Chapter 4 with resonators. The theory of waveguides is discussed in Chapter 5, while Chapter 6 discusses refraction. Surface waves are the topic of Chapter 7. The next two chapters deal with scattering by smooth objects (Chapter 8) and diffraction by edges (Chapter 9). The last Chapter is concerned with transient waves. Seven appendices give details of a variety of mathematical techniques and special functions. Each chapter concludes with a set of exercises.

The book presents a wealth of interesting and valuable material. It is an excellent contribution to the literature on wave phenomena. The sophisticated reader will find most he or she may ever want (or need) to know about analytical methods to solve linear acoustic and electromagnetic wave problems.

[1]Professor, Department of Civil Engineering, Northwestern University, Evanston, IL 60208.

Control of Structures, by H. H. E. Leipholz and M. Abdel-Rohman. Martinus Nijhoff Publishers, The Netherlands, 1986. 413 pages. Price: $105.50.

REVIEWED BY W. L. HALLAUER, JR.[2]

Many conference proceedings and doctoral dissertations have beeen devoted to structural control in recent years, but this is apparently the first published monograph on the subject. The authors intend it to serve as a reference for researchers, practicing engineers, and students in advanced courses on structural dynamics and control. The book consists primarily of short summaries of theory, extensive numerical simulations of control for simple beam structures, and discussion of the simulation results. Much of the material is drawn from the authors' previous publications. There is very little reference to experiments and in-service implementations, and no measured results are presented.

Although this book includes much general material on control theory, its title suggests a substantially broader subject area than is considered. A title such as "Active Control of the Dynamic Response of Civil Structures" would more accurately describe the actual contents. Most of the book is not directly relevant to applications outside of civil engineering, such as control of acoustically excited structural response and control of static and dynamic deformation of flexible aircraft and spacecraft structures.

Chapter 1—Introduction to Structural Control (35 pages)—defines and illustrates the major classes of structural control (active, passive, open-loop and feedback), discusses active feedback control of a one-degree-of-freedom oscillator, and conceptually describes some control devices. The appendix summarizes the principal concepts and definitions of classical control theory.

Chapter 2—Morphology of Structural Control (29 pages)—considers several issues with the use of partial differential operators, functional analysis, and examples involving strings and beams. The authors' main point is that conceptual design of structural control generally allows a wide variety of options for control operators and optimization objectives, so that the design for a particular situation is not simply a well defined mathematical process, but rather an art based on experience. Also, discretization by modal analysis is introduced, and the authors discuss the problems of high order and spillover instability associated with a large number of modes.

Chapter 3—Automatic Active Control of Simple Span Bridges (160 pages)—considers: classical control; modern control by pole assignment, optimal regulation, and optimal tracking; and state estimation by pole assignment. A bridge is idealized as a uniform simply-supported beam, and the distur-

[2]Professor of Aerospace Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.