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BOOK REVIEWS

MECHANICAL VIBRATIONS: THEORY AND APPLICATIONS TO STRUCTURAL DYNAMICS (second edition), 1997, by M. Geradin and D. Rixen. Chichester: John Wiley & Sons Limited. xiv + 425 pp. Price £29.95 (paperback). ISBN 047197546X

The first edition of this book appeared in 1994. It was such a success that a second edition was produced only three years later. The changes made are briefly summarized in the Preface which states that "Some sections have been rewritten for better rigor or clarity. The material presentation has been adapted in order to help the reader to distinguish between primary and secondary topics: examples and secondary matters are now better separated from the central part of the text".

The first thing that strikes one about the second edition is the improved layout of the text, which makes it easier to read. Slightly larger typeface has been used and the text is no longer wrapped around figures. Also the examples and secondary material are enclosed in brackets.

Chapter 1 deals with methods of deriving equations of motion using virtual work, Hamilton's principle and Lagrange's equations and is virtually unchanged. The second chapter concentrates on free and forced response of undamped multi-degree-of-freedom systems. Here, three improvements have been made involving either extended presentation or a change of notation. Chapter 3 deals with vibrations of damped multi-degree-of-freedom systems. Two improvements to the text have been made and two figures changed. In particular, the discussion on stationary reactive power criterion has been rewritten.

In Chapter 4, wave propagation in homogeneous elastic media is treated before considering the vibration of one-dimensional continuous systems such as bars, strings and beams, both without and with shear deflection. There is also an extensive section on bending vibrations of thin plates. The only change here is the insertion of details of the mode acceleration method in section 4.4.3 which describes the mode superposition method of calculating the response to external excitation. No changes have been made to Chapter 5 which deals with approximate methods of solution for continuous systems. The Rayleigh–Ritz method is applied to bars, beams and plates. This is followed by an introduction to the finite element method as applied to rods, beams, two- and three-dimensional frameworks.

Chapter 6 contains an extensive treatment of methods of solving eigenproblems which arise in the free vibration analysis of multi-degree-of-freedom systems. As well as discussing each method in detail, guidelines are given as to which method to use depending upon the number of system degrees of freedom. Some additional remarks have been added regarding iteration methods. Two techniques of reducing the number of degrees of freedom are also presented, namely the so-called reduction and substructuring methods. The section on static condensation has

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been improved by including more details in the discussion and some errors corrected. A change of notation has been introduced in the section on substructuring methods.

Chapter 7 deals with direct time integration methods for analysing transient response. Several techniques are presented and their stability and accuracy investigated when applied to linear systems. An extra figure with associated discussion has been added to section 7.3.7 which compares the solutions obtained with the Newmark and Hilber–Hughes–Taylor α methods. In section 7.4.2 the discussion regarding the critical time step has been changed to improve clarity and the effect of mass lumping is now stressed. Again in section 7.4.3 additional text has been introduced to improve understanding. The chapter ends with a short discussion on the time integration of non-linear systems.

The book has been devised for use by senior undergraduates and graduate students. It is also dedicated to research and design engineers who wish to improve their understanding and knowledge of structural dynamics. This second edition is essentially the same as the first one, except that the excellent clarity has been improved even further, which will ensure that it will be used for many years to come.

M. PETYT

HANDBOOK OF ACOUSTICS, 1998, Malcolm J. Crocker (Editor-in-Chief). New York, Chichester, Weinhelm, Brisbane, Singapore, Toronto: John Wiley & Sons Inc. (a Wiley-Interscience Publication). xvii + 1461 pp. Price (hardback) £135.00. $150.00 ISBN 0 471 25293X.

This Handbook is a real handful, its dimensions being in inches $9{\cdot}5 \times 7{\cdot}75 \times 2{\cdot}75$, or in centimetres $24{\cdot}2 \times 19{\cdot}5 \times 7$. As its Editor-in-Chief, Malcolm J. Crocker, says in his Preface, its contents of 1461 pages is a selection from the 2017 pages of the four-volume *Encyclopedia of Acoustics*, published in 1997, of which he was also Editor-in-Chief, but with the addition of a new chapter on "Analyzers".

The selection consists of the omission of the *Encyclopedia's* chapters on bioacoustics and animal bioacoustics, and about 20% of the other chapters. These changes have produced a single-volume *Handbook* of 1461 pages priced at £135 in the U.K., as against the 2017 pages of the four volumes of the *Encyclopedia* priced at $395 (about £247). This is a considerable reduction in price, especially attractive to those not interested in human or animal bioacoustics. The *Handbook* is thus in a price range which should make it more attractive to buyers from secondary or high schools, colleges, universities or other institutions, and private persons, all of whom may wish to have something on their bookshelves providing up-to-date and authoritative information on most of acoustics.

All buyers of the *Handbook* can be assured that the information in it is of the highest quality. (I assured all potential readers of the *Encyclopedia* in my review of it, published about a year ago in this journal, that the information therein was of the highest quality!)

I must once again, however, warn buyers and readers that with all such books there is the problem that knowledge is advancing so fast these days that all

encyclopedias, handbooks, etc., probably need to be substantially up-dated every five years or so. Already, as Robert T. Beyer has mentioned in his review of the *Encyclopedia of Acoustics* (in *Physics Today*, June 1998), he hoped for ''the later appearance of a volume 5 of the *Encyclopedia of Acoustics* to include such topics as cochlear implants, concert hall acoustics, speech perception in the young and voice identification, as well as more material on signal processing''.

I am sure that all of us currently engaged in acoustics research and practice could add topics in addition to those of Professor Beyer.

Hence, Editor-in-Chief Malcolm J. Crocker, having produced the excellent *Handbook*, as well as the current *Encyclopedia*, still has work to do on up-dating them. I am sure that all concerned with the acquisition of new knowledge of acoustics and the dissemination of that knowledge hope that he continues his good work and are willing to help him to do so.

So, I say that if you haven't bought the *Encyclopedia*, buy the *Handbook* if you can afford it, and in any case put a bit aside so that you can buy the up-dating supplements in due course.

P. E. Doak

DEAF ARCHITECTS AND BLIND ACOUSTICIANS? A GUIDE TO THE PRINCIPLES OF SOUND DESIGN, 1998, by Robert E. Apfel. New Haven, Connecticut, U.S.A.: Apple Enterprises Press. Price $24.95. ISBN 0-9663331-0-1.

As the title implies this attractive little book is one more attempt to make a bridge between the disciplines of architecture and acoustics. There have been many such attempts in the past 7 decades; from gracious tomes such as ''Planning for Good Acoustics'' by Hope Bagenal and Alex Woods in the 30's, to the pragmatism of Parkin and Humphreys, ''Acoustics Noise and Buildings'' in the 50's, Reichardt's ''Gute Akustik: aber wie?'' in the 70s, the outstandingly useful ''Architectural Acoustics'' of David Egan in the 80's (extensively referenced in this volume), the more specialized ''Auditorium Acoustics and Architectural Design'' by Barron in the 90s, and many others including of course Beranek's two monumental works. The successful ones have usually reflected an attractive personal style, a willingness to communicate and the gift of conveying sometimes difficult matters without either trivializing them or patronising the reader.

How then does this book fare? To answer this requires some knowledge of the audience—indeed one can deduce quite a lot about the Yale School of Architecture and its students from the contents and the style. There is probably no other profession which attracts students with such diverse backgrounds and abilities into its university courses, as architecture. In the physical science dimension alone there will be some for whom mathematics holds no fears and others whose numeracy is pushed to the limit by fractions. In such a group, one will never succeed with all—the best one can hope to do is to set a flag that there are design implications for which help may be needed later. As Apfel points out in his introduction, the preoccupation of design students is with design, especially in the competitive design studio.

And that is what this short primer is aimed at—setting flags for acoustic issues. It contains rather a grab-bag of topics which as the author observes, has no pretensions to be comprehensive, but each topic is interesting and the light tone of the text is supplemented by technical appendices and references. It is curiously dated in some ways, for example for the use of ''NC'' referenced to a Progressive Architecture article in 1959! One could almost imagine Bob Newman, Bob Apfel's mentor, standing at his shoulder. One could also quarrel with the accuracy of some unsupported assertions, but that would be to miss the point of the book. As a primer for design-preoccupied architecture students, it is an excellent shot.

A. H. MARSHALL

INTRODUCTION TO WAVE PROPAGATION IN NONLINEAR FLUIDS AND SOLIDS, 1998, by D. S. Drumheller. Cambridge University Press. xix + 513 pp. Price (paper back) £29.95, $49.95. ISBN 0 521 58746 8; (hardback) £80.00, $110.00. ISBN 0 521 58313 6

This book, entitled ''Introduction to Wave Propagation in Nonlinear Fluids and Solids'' is in fact an introductory textbook on rather more than its title might suggest. Indeed, in this respect, a better title might have been ''Introduction to Linear and Nonlinear Wave Propagation in Linear and Nonlinear Fluids and Solids''. Whatever it might be called, it certainly can serve as a very useful text for advanced undergraduates and postgraduates, and as a reference for professional engineers and applied physicists. An especially welcome feature is that although essential mathematics is not neglected it is the physics of the phenomena concerned which receives the most attention.

The book's format is that of a sequence of lectures collected severally into an eight page Introduction, four Chapters and two Appendices. The Chapter titles are 1. Fundamentals, 2. Mechanical Waves, 3. Thermomechanics, and 4. Constitutive Models; the Appendices are A. Numerical Methods, and B. Material Properties. In addition there is a two-page list of basic textbook/monograph references, and a five-page Index.

The Chapter subsection titles give a good indication of the range of the subject matter. In Chapter 1 they are 1.1 Index Notation (i.e., Cartesian tensor notation, etc.), 1.2. Motion, 1.3. One-dimensional Motion, 1.4. Deformation, 1.5. One-dimensional Deformation, 1.6. Stress, 1.7. One-dimensional Stress, and 1.8. Laws of Motion.

In Chapter 2 they are 2.1. Elastic Material, 2.2. One-dimensional Nonlinear-Elastic Equations, 2.3. Wave Equations, 2.4. Method of Characteristics, 2.5. Riemann Integrals, 2.6. Structural Waves, 2.7. Shock Waves, 2.8. Wave-Wave Interactions, and 2.9. Steady Waves.

In Chapter 3 they are 3.1. Balance of Energy, 3.2. Transformability of Energy, 3.3. Equilibrium States and Processes, 3.4. Wave States and Processes, 3.5. Heat Conduction, 3.6. Enthalpy and Gibbs Energy, and 3.7 Summary.

In Chapter 4 they are 4.1. Ideal Gas, 4.2. Mie–Grünheisen Solid, 4.3. Elastic–Plastic Solid, 4.4. Saturated Plastic Solid, and 4.5. Detonation and Phase Transformation.

Each of the Chapters includes some 50 or so well chosen exercises, and the student who conscientiously works through these will acquire valuable physical understanding of the phenomena involved.

This list of sub-section titles indicates that the topic coverage in the book is very wide indeed. Also diagrams and other illustrations are liberally provided (including one of Maxwell's Demon!): 39 in Chapter 1, 125 in Chapter 2, 33 in Chapter 3, and 82 in Chapter 4, and 10 in Appendix A.

This book is a very valuable addition to the literature, filling a gap which needed to be filled. The author deserves our thanks and congratulations for providing us with it.

P. E. Doak