Book Reviews

Mechanical Vibrations: Active and Passive Control

T. Krysinski and F. Malburet

ISTE, 6 Fitzroy Square, London W1T 5DX, UK. 2007. 367pp. Illustrated. £90. ISBN 978-1-905209-29-3.

As most of this book relates to helicopter vibration, its relevance to general mechanical engineers is limited. The authors are well-qualified to write it, Krysinski as head of Eurocopter's Vibration Department and Malburet as a University researcher and teacher in helicopter vibration control.

The book has two parts, first the sources of vibration and then the methods of controlling it. In the first part, chapter 1 deals with the vibratory out-of-balance forces and instabilities of rotating disks and rotors and how to balance them. chapter 2 analyses the vibratory forces generated within a piston engine while chapter 3 introduces the helicopter rotor, its complicated dynamics and corresponding multi-harmonic aerodynamic loads. chapter 4 considers the hub loads generated by swash-plate cyclic pitch control and by control flaps on the blade. chapters 5 and 6 deal with vibratory forces from rotating couplings (i.e. Hooke's joints) between non-aligned rotating shafts, and the extraneous unsteady aerodynamic loads from turbulence around the helicopter.

Part 2, entitled 'Vibration Monitoring Systems', should really be entitled 'Methods of Vibration Control'. Three chapters are concerned with vibration isolation between the whole rotor system and the fuselage, covering the elementary theory of vibration isolation between two elastically-linked rigid bodies and then the ingenious inventions of helicopter engineers. These include self-tuning (semi-active) systems and fully-active systems. Throughout Part 2 there are numerous illustrative examples and photographs of systems which have actually been used and validated. Regrettably, most of the photographs are poorly reproduced.

The final six chapters of Part 2 deal, in effect, with different forms of the familiar vibration neutraliser (= vibration absorber). The standard theory of the tuned, damped simple neutraliser is presented, followed by examples of its adaptations and applications to helicopters. A single example of a self-adjusting (semi-active) neutraliser has a chapter to itself. The chapter on active absorbers covers electro-magnetic, hydraulic and rotating mass actuation. Three short chapters on passive resonators, active resonators and a particular active system conclude the book.

The Foreword states that the book is the first of its kind on its topic and does not insist on complicated mathematical modelling. Descriptive material within the book allows much of it to be followed without mathematics, but the quite extensive mathematics that is presented is often difficult to follow due to strange or unexplained notation and the absence of any list of symbols. Nevertheless, it is an informative book, especially about Eurocopter's methods of tackling helicopters' endemic vibration problem.

Professor D.J. Mead, CEng, FRAeS

Hydrodynamics and Sound

M.S. Howe

Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, UK. 2007. 463pp. Illustrated. £50. ISBN 0-521-86862-9.

At the outset of this book it is stated that the content is aimed at a first graduate course in fluid dynamics, however this opening statement hides something of the depth and detail of the material. As one might expect from an experienced author of other well-respected books, the subject material moves with pace and poise across a range of topics, each of which is elegantly linked into the chain of development. Although the foundations of the topics discussed lie in an introductory graduate level course, there is a depth of material that will make this book appealing to researchers and students alike.

The content is mostly (with a few notable exceptions) concerned with inviscid fluid mechanics, covering topics of practical relevance for which theoretical progress can be made. There is no discussion of numerical techniques (some limited numerical results are shown where appropriate); this does not detract from the book and is entirely in line with the author's aim of targeting theoretical understanding.

The beginning chapter, as one might expect, is a brief recap of the governing equations for incompressible and compressible flow. At just twelve pages this is the briefest part of the book. chapter 2 develops potential flow of an incompressible fluid, then chapter 3 discusses ideal flow in a plane.

As with most chapters, the early material will look comfortingly familiar to anyone who has taken a first course in fluid mechanics, but the author delves more deeply into each topic, discussing conformal mappings, free-streamline and thin-aerofoil theories for example. The final chapter of the first 'section' of the book turns to rotational incompressible flow, beginning from the familiar territory of vortex lines/tubes and Biot-Savart law, but then developing towards a detailed discussion of the forces exerted on a rigid body after a brief interlude to introduce some simple (relevant) viscous flows.

The second 'section' of the book (chapters 5 and 6, which comprise approximately one-third of the text) shift emphasis slightly and address the topics of free-surface gravity waves and sound waves.

There are inevitably overlaps with other texts and the author clearly states that he was inspired by the classic in the field, *Lighthill's Waves in Fluids* (Cambridge University Press. 1978).

I liked the style and content of the book throughout and there were only a couple of minor things that detracted from the overall feel. Throughout the book there are no descriptive figure captions and the eager reader is left to search the body of text for the figure number. I also prefer a slightly more expansive development of the governing equations than given in chapter 1; although the content is certainly sufficient to set the scene for the later chapters.

In summary, this is an excellent and comprehensive book that will be of use to a broad audience, bringing together some elegant classical theoretical results into a single well-researched volume.

Richard E. Hewitt

Advanced Vector Analysis for Scientists and Engineers

M. Rahman

WIT Press, Ashurst Lodge, Ashurst, Southampton SO40 7AA. 2007. 306pp. Illustrated. £95. ISBN 1-84564-093-4.

Several years ago I reviewed *Applied Vector Analysis* by Rahman and Mulolani (*Aero J*, 106, (291), May 2002) which was published by CRC Press. I was therefore pleased to be asked to review the current volume which, judging by its title, I expected would build upon the previous book and take me deeper into the intricacies of vector analysis. I have been sorely disappointed.

Advanced Vector Analysis for Scientists and Engineers can only be described as the 2nd edition of *Applied Vector Analysis*. For the most part the text of the two books is identical. Some parts of the text have been re-arrranged in a minor way; for instance chapter 1 of the earlier book has become Appendix C of the new book, and whilst most of chapter 2 of the earlier work appears as chapter 1 of this book, some later sections of chapter 2 now appear in chapter 3 of the new book.

The main changes between the two books are to introduce, at the end of each chapter, a section of a page or two summarising the content of the chapter, to add a new section to chapter 3, to add a couple of new sections to chapter 8 (amounting to about five pages of text in a chapter of 54 pages), to add a couple of additional examples and four new exercises (split between chapters 4 and 5) and to add a new chapter 7 on Orthogonal Curvilinear Coordinates amounting to 27 pages (in a book of 306 pages). The new chapter does not add significantly to the academic value of the book.

All of this would be understandable if the preface of *Advanced Vector Analysis for Scientists and Engineers* noted its relationship to the earlier work and offered an explanation and rationale for the updating and change of publisher. It is after all not unusual for an author to seek a new publisher if his existing publisher decides to let a title go out of print. But the preface of *Advanced Vector Analysis for Scientists and Engineers* is nearly identical to the preface of the earlier work and makes no reference at all to the existence of the earlier work. In addition I find, on browsing the world wide web, that CRC Press are currently advertising a second edition of *Applied Vector Analysis* by Rahman and Mulolani due to be published on 27 Sept 2007!

So, to summarise, essentially the same text is available from two different publishers under two different titles with no acknowledgement made of the link. I find this an unusual and not entirely satisfactory circumstance. As far as the merits of the book per se are concerned, I have nothing to add to my review of the original work.

Professor R.R. Clements, CEng, MRAeS

Environmentally Conscious Mechanical Design

Edited by M. Kutz

John Wiley and Sons, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, UK. 2007. 394pp. Illustrated. £70. ISBN 978-0-471-72636-4.

The editor has assembled a team of authors to describe various aspects of design with the environmental impact in mind. With so much current emphasis on 'green' issues, they have produced a book that is timely and useful.

Chapter 1 describes strategies and methods for environmental design, including topics such as setting objectives, environmental reviews, and checklists. It includes four rather briefly-described case histories.

Chapter 2 is on design for sustainability, where sustainability is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. It describes national and international regulations and moves to create standards. Two case studies are also given.

Chapter 3 is on life cycle design. It provides an interesting and thorough overview of principles and methods. Inevitably, there is some overlap with the previous chapters.

Chapter 4 describes reverse engineering, with a very detailed example. I could not detect the connection with environmental engineering.

Chapters 5 and 6, on design for reliability and for maintainability, are not helpful. Both over-emphasise mathematical aspects, provide dated and incomplete references, and make no attempt to connect the topics with environmental issues.

Chapters 7, 8 and 9 describe re-use and recycling technologies, design for remanufacturing and materials selection. These are excellent.

Chapter 10 describes quality management aspects, particularly total quality management (TQM) and six-sigma approaches. It includes quality function deployment (QFD), statistical design of experiments, statistical process control (SPC). Strangely, there is no mention of ISO9000.

The book presents a thorough overview of most of the topics relevant to its title. One notable exception, however, is ISO14000, the standard for environmental management, which receives scant mention in a mere 5 lines. The title is also a little misleading, since the book is not limited to mechanical design, but covers general engineering aspects, including electronics.

Patrick O'Connor, CEng, MRAeS

Aircraft Performance

M. Saarlas

John Wiley and Sons, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK. 2007. 282pp. Illustrated. £80. ISBN 0-470-04416-0.

This book is addressed to an audience of undergraduate college students of engineering and perhaps some high school students. It is an introductory text to a wide discipline ranging from airplane aerodynamics to aircraft design. There is a breadth of coverage that may stir interest also in students beyond engineering.

From the point of view of the student who has never studied the subject before the book is well balanced. The drawings of the airplanes shown throughout the book have been poorly reproduced by the publisher. They seem to be placed here and there without a clear purpose. However, at a closer look the figures have all been badly reproduced by John Wiley. This seems a poor marketing decision, considering the availability of similar books on the market.

This is clearly a teaching resource. The book contains chapters on the equations of motion, the basic performance parameters, climbing flight, range and endurance, unsteady flight in the vertical plane, manoeuvring flight. There is an appendix for calculating aircraft engines performance. Basically, the book starts with a discussion of the energy method, which is quite powerful for first-order performance calculations.

The language can be easily understood. A number of problems with outline answers in each chapter is also quite useful. The number of problems throughout the various chapters is fair. All the problems require closed-form solutions. There is hardly any mention to numerical solution of more complex flight problems. The book is complemented with appendices (conversion factors, airplane data) and an alphabetical index. The references, though, are disappointing. This is a vast field of aircraft engineering, and potential readers may be interested in pursuing their research further. The author only mentions 19 books (including some noted below by the reviewer) and just two papers.

It is believed that the author will have difficulty in finding an audience in the aerospace profession, because the topics presented are already available in similar form in other books at the same level, some of which have the same title. Some examples are: 1.) Hale, F.J. *Introduction to Aircraft Performance, Selection and Design* (Addison-Wesley); 2.) Vinh, N.X. *Flight Mechanics of High-Performance Aircraft* (Cambridge University); 3.) Asselin, M. *Introduction to Aircraft Performance* (AIAA); 4.) Mair, W. and Birdsall, D. *Aircraft Performance* (Cambridge University Press); 5.) Eshelby, M. *Aircraft Performance: Theory and Practice* (Arnold Publications/AIAA).

In summary, the book does not contribute much to the knowledge of aircraft performmance. This is a field with dozens of very good books, each perhaps with a different focal point. However, it is a good resource for the students or as an introductory subject.

Dr. A. Filippone

https://doi.org/10.1017/S0001924000087261 Published online by Cambridge University Press