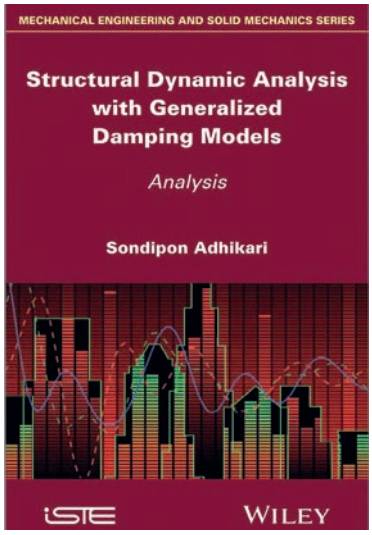
Review

Despite a lack of experimental examples, Tianjian Ji considers this a useful reference book for researchers and those who find the conventional viscous damping model insufficient in their practical design and analysis.

Structural Dynamic Analysis with Generalized Damping Models: Analysis



Author: Sondipon Adhikari
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This book is a monograph that systematically presents the modelling and analysis of damping for general linear systems, with an emphasis on non-viscous damped models. The book is the result of many years of research and teaching by the author in the area of damping vibration problems.

The book consists of six chapters. The introduction is actually a very good review of work and of current understanding of modelling, as well as analysis of damping; it covers analysis and identification of viscous and non-viscous damped systems. This review leads to several research questions on modelling damping and provides a basis for the scope of the book. Chapter 2 discusses dynamics of un-damped and viscous damped systems and the contents are presented in a rigorous manner supported by examples set in both the time and the frequency domains. Chapters 3 and 4 deal with non-viscous, damped single-degree-of-freedom and multiple-degree-of-freedom systems, in which the damping force is not proportional to velocity. The analytical development of general non-viscous damping models for linear systems is presented in Chapter 5. Using non-viscous damping will unavoidably make computation more demanding, and the final chapter develops accurate and efficient computational methods.

Damping models in which the dissipative forces do not depend on instantaneous velocities are considered as non-viscous damping models. There can be many such models, which are either based on the physics of the problems or intuitively selected with parameters that are fitted to experimental results. The damping model used for a single-degree-of-freedom system in this book eventually contains a viscous damping factor and a non-viscous damping factor. This includes a conventional viscous damping model when the non-viscous damping factor becomes zero; it develops a new understanding that may represent more phenomena in vibration damping.

This book focuses on theoretical and computational aspects of damping with a number of numerical examples. It would have been helpful if some experimental examples had been included to illustrate the significance and appropriateness of non-viscous damping models in practice. However, a companion book, *Structural Dynamic Analysis with Generalized Damping Models: Identification*, written by the same author, has been published at the same time1. According to the author, the companion book deals with the identification and quantification of both viscous and non-viscous damping.

Damping is important to vibration analysis and design, but less well understood than other parameters, such as mass, stiffness and dynamic loading. This book makes a contribution to the understanding and application of damping models.

The bibliography contains over 400 references and provides a good source of information. The citation method used is effective and different from many other books. A code is used instead of a sequential number, showing the first three letters of the surname of the first author and the last two numbers of the year of the reference published, e.g. [ADH 10].

This book ideally serves as a reference book relating to aerospace, mechanical and civil engineering and various sub-disciplines within them. The book is particularly useful to those who conduct research in the field of damped vibration and to those who find that the conventional viscous damping model is insufficient in their practical design and analysis.

References

► 1) Adhikari S. (2013) *Structural Dynamic Analysis with Generalized Damping Models: Identification*, London: Wiley-ISTE

Tianjian Ji
Tianjian Ji is Senior Lecturer at the School of Mechanical, Aerospace and Civil Engineering, University of Manchester. He specialises in structural dynamics, in particular structural vibration induced by rhythmic crowd loads and human–structure interaction. He is keen to study and use structural concepts which combine practice, research and teaching. Recently he has been studying t'ai chi movements for improving balance in older people.