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0521633206 - Acoustics of Fluid-Structure Interactions - M. S. Howe

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Acoustics of Fluid–Structure Interactions

Acoustics of Fluid–Structure Interactions deals with the theory of the production and absorption of noise and vibration by fluid flow. This includes the theory of aerodynamic sound, as well as more conventional areas of acoustics and structural vibration. After providing the background material in fluid mechanics, acoustics, and structural vibrations, it proceeds to more advanced topics, suited to a graduate level course on the theory of acoustics and aerodynamic sound. Theoretical concepts are illustrated and extended by numerous examples, many of which include complete worked solutions.

This book will be useful as a reference for analytical methods for modeling acoustic problems, as a repository of known results and methods in the theory of aerodynamic sound, and as a graduate level textbook.

Dr. Howe is Professor of Theoretical Mechanics at Boston University. He received his PhD in Continuum Mechanics from the Imperial College in London. Dr. Howe has over 25 years experience of research in fluid mechanics, acoustics, random vibration, and structural mechanics.

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Preface

This book deals with that branch of fluid mechanics concerned with the production and absorption of sound occurring when unsteady flow interacts with solid bodies. Problems of this kind are commonly known under the heading of *aerodynamic sound* but often include more conventional areas of *acoustics* and *structural vibration*. Acoustics is here regarded as a branch of fluid mechanics, and an attempt has therefore been made in Chapter 1 to provide the necessary background material in this subject. Elementary concepts of classical acoustics and structural vibrations are also reviewed in this chapter. Constraints of space and time have required the omission or the curtailed discussion of several important subareas of the acoustics of fluid–structure interactions, including in particular many problems involving supersonic flow. The book should be of value in one or more of the following ways: (i) as a reference for *analytical methods* for modeling acoustic problems; (ii) as a repository of known results and methods in the theory of aerodynamic sound and vibration, which have tended to become scattered throughout many journal and review articles over the past forty or so years; and (iii) as a graduate level textbook. Chapter 1 and selected topics from Chapters 2 and 3 have been used for several years in teaching an advanced graduate level course on the theory of acoustics and aerodynamic sound.

Theoretical concepts are illustrated and sometimes extended by numerous examples, many of which include complete worked solutions. Every effort has been made to ensure the accuracy of formulae, both in the main text and in the examples. The author would welcome notification of errors detected by the reader and more general suggestions for improvements.

Acknowledgement must be made to the Board of Directors of Bolt Beranek and Newman, Inc. (BBN) for the granting of a sabbatical leave during which the first half of this book was drafted. Much of the material is the outcome of

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