

Preface

Vibration and structural acoustics analysis is nowadays an essential requirement for high-quality structural and mechanical design in order to assure acoustic comfort and the integrity, reliability and fail-safe behavior of structures and machines. In some conditions vibration and radiated sound in structures and machines is desirable, as is the case of the motion of a tuning fork, the enjoyable melody that a classical guitar may produce or the motion induced by vibration conveyors. More often, vibration and the underlying radiated noise are undesirable and inconvenient, as is the case of the vibrational motion of internal combustion engines, the noise generated by railway traffic, the imperfections in the milling and turning processes due to machine tool chatter or the vibration instability of light-weight aerospace structures.

The underlying technologies of this field of multidisciplinary research are evolving very fast and their dissemination is usually scattered over different and complementary scientific and technical publication means. In order to make it easy for developers and technology end-users to follow the latest developments and news on the field, this book collects into a single volume selected, extended, updated and revised versions of the papers presented at the *Symposium on Vibration and Structural Acoustics Analysis*, coordinated by J. Dias Rodrigues and C.M.A. Vasques, of the *3rd International Conference on Integrity, Reliability & Failure (IRF'2009)*, co-chaired by J.F. Silva Gomes and Shaker A. Meguid, held at the Faculty of Engineering of the University of Porto, Portugal, 20–24 July 2009. The selected papers were chosen among the more than 60 papers presented at the conference symposium.

Written by experienced practitioners and researchers in the field, this book brings together recent developments in the field, spanning across a broad range of themes: vibration analysis, analytical and computational structural acoustics and vibration, material systems and technologies for noise and vibration control, vibration-based structural health monitoring/evaluation, machinery noise/vibration and diagnostics, experimental testing in vibration and structural acoustics, applications and case studies in structural acoustics and vibration. Each chapter somewhat presents and describes the state of the art, presents current research results and discusses the need

for future developments in a particular aspect of vibration and structural acoustics analysis.

The book is envisaged to be an appellative text for newcomers to the subject and a useful research study tool for advanced students and faculty members. Practitioners and researchers may also find this book an appellative reference that addresses current and future challenges in this field. The variety of case studies is expected to stimulate a holistic view of sound and vibration and related fields and to appeal to a broad spectrum of engineers such as the ones in the mechanical, aeronautical, aerospace, civil and electrical communities.

With the synergistic combination of efforts of authors, editors and invited reviewers, this book brings together so many interrelated and yet diverse topics in a single volume. Hopefully, the editors expect it allows the readers to get an updated sense of the interest, technical diversity and applicability of this ever evolving research field, and that it may be used as a road-map to the required practical understanding and technical skills required to analyze and engineer new solutions for problems on vibration and structural acoustics fields.

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