

Rotordynamics Prediction in Engineering

Second Edition



**Michel Lalanne
and Guy Ferraris**

Rotordynamics Prediction In Engineering

Michel Lalanne, Guy Ferraris



Rotordynamics Prediction In Engineering:

Rotordynamics Prediction in Engineering Michel Lalanne, Guy Ferraris, 1998-02-04 In this updated and revised second edition the authors present a systematic and practical approach to the analytical and numerical aspects of the prediction of rotordynamics behaviour The influence of bending is a main theme of the book although the effects of torsion are also considered The use of finite element techniques and the characteristics of rotor elements are introduced The book goes on to consider simple models showing basic phenomena which are then linked to industrial applications such as turbocompressors high pressure centrifugal compressors and steam and air turbines Key features include The inclusion of a computer program available free of charge on the Internet The development of a simple model of co axial multirotors New industrial applications and 1995 API specifications This book will be of great interest and value to students and engineers concerned with predictions in rotordynamics and mechanical engineering *Rotordynamics Prediction in Engineering* Lalanne, 1996-08 **Rotordynamics Prediction in Engineering** M. Lalanne, Guy Ferraris, 1990-07-23 It is increasingly necessary in the design of rotating machinery to predict accurately the dynamic behaviour of rotors in bending and in torsion The influence of bending is the main subject of this book with one whole chapter devoted to the influence of torsion **Machinery Vibration and Rotordynamics** John M. Vance, Fouad Y. Zeidan, Brian G. Murphy, 2010-05-24 An in depth analysis of machine vibration in rotating machinery Whether it s a compressor on an offshore platform a turbocharger in a truck or automobile or a turbine in a jet airplane rotating machinery is the driving force behind almost anything that produces or uses energy Counted on daily to perform any number of vital societal tasks turbomachinery uses high rotational speeds to produce amazing amounts of power efficiently The key to increasing its longevity efficiency and reliability lies in the examination of rotor vibration and bearing dynamics a field called rotordynamics A valuable textbook for beginners as well as a handy reference for experts Machinery Vibration and Rotordynamics is teeming with rich technical detail and real world examples geared toward the study of machine vibration A logical progression of information covers essential fundamentals in depth case studies and the latest analytical tools used for predicting and preventing damage in rotating machinery Machinery Vibration and Rotordynamics Combines rotordynamics with the applications of machinery vibration in a single volume Includes case studies of vibration problems in several different types of machines as well as computer simulation models used in industry Contains fundamental physical phenomena mathematical and computational aspects practical hardware considerations troubleshooting and instrumentation and measurement techniques For students interested in entering this highly specialized field of study as well as professionals seeking to expand their knowledge base Machinery Vibration and Rotordynamics will serve as the one book they will come to rely upon consistently **Analytical Methods in Rotor Dynamics** Andrew D. Dimarogonas, Stefanos A. Paipetis, Thomas G. Chondros, 2013-02-19 The design and construction of rotating machinery operating at supercritical speeds was in the 1920s an event of revolutionary importance for the then

new branch of dynamics known as rotor dynamics In the 1960s another revolution occurred In less than a decade imposed by operational and economic needs an increase in the power of turbomachinery by one order of magnitude took place Dynamic analysis of complex rotor forms became a necessity while the importance of approximate methods for dynamic analysis was stressed Finally the emergence of fracture mechanics as a new branch of applied mechanics provided analytical tools to investigate crack influence on the dynamic behavior of rotors The scope of this book is based on all these developments No topics related to the well known classical problems are included rather the book deals exclusively with modern high power turbomachinery

Multiphysics Modeling: Numerical Methods and Engineering Applications Qun Zhang, Song Cen, 2015-12-15 Multiphysics Modeling Numerical Methods and Engineering Applications Tsinghua University Press Computational Mechanics Series describes the basic principles and methods for multiphysics modeling covering related areas of physics such as structure mechanics fluid dynamics heat transfer electromagnetic field and noise The book provides the latest information on basic numerical methods also considering coupled problems spanning fluid solid interaction thermal stress coupling fluid solid thermal coupling electromagnetic solid thermal fluid coupling and structure noise coupling Users will find a comprehensive book that covers background theory algorithms key technologies and applications for each coupling method Presents a wealth of multiphysics modeling methods issues and worked examples in a single volume Provides a go to resource for coupling and multiphysics problems Covers the multiphysics details not touched upon in broader numerical methods references including load transfer between physics element level strong coupling and interface strong coupling amongst others Discusses practical applications throughout and tackles real life multiphysics problems across areas such as automotive aerospace and biomedical engineering

Linear and Nonlinear Rotordynamics Yukio Ishida, Toshio Yamamoto, 2013-03-05 A wide ranging treatment of fundamental rotordynamics in order to serve engineers with the necessary knowledge to eliminate various vibration problems New to this edition are three chapters on highly significant topics Vibration Suppression The chapter presents various methods and is a helpful guidance for professional engineers Magnetic Bearings The chapter provides fundamental knowledge and enables the reader to realize simple magnetic bearings in the laboratory Some Practical Rotor Systems The chapter explains various vibration characteristics of steam turbines and wind turbines The contents of other chapters on Balancing Vibrations due to Mechanical Elements and Cracked Rotors are added to and revised extensively The authors provide a classification of rotating shaft systems and general coverage of key ideas common to all branches of rotordynamics They offers a unique analysis of dynamical problems such as nonlinear rotordynamics self excited vibration nonstationary vibration and flow induced oscillations Nonlinear resonances are discussed in detail as well as methods for shaft stability and various theoretical derivations and computational methods for analyzing rotors to determine and correct vibrations This edition also includes case studies and problems

IUTAM Symposium on Emerging Trends in Rotor Dynamics K. Gupta, 2011-01-06 Rotor dynamics is an

important branch of dynamics that deals with behavior of rotating machines ranging from very large systems like power plant rotors for example a turbogenerator to very small systems like a tiny dentist s drill with a variety of rotors such as pumps compressors steam gas turbines motors turbopumps etc as used for example in process industry falling in between The speeds of these rotors vary in a large range from a few hundred RPM to more than a hundred thousand RPM Complex systems of rotating shafts depending upon their specific requirements are supported on different types of bearings There are rolling element bearings various kinds of fluid film bearings foil and gas bearings magnetic bearings to name but a few The present day rotors are much lighter handle a large amount of energy and fluid mass operate at much higher speeds and therefore are most susceptible to vibration and instability problems This have given rise to several interesting physical phenomena some of which are fairly well understood today while some are still the subject of continued investigation Research in rotor dynamics started more than one hundred years ago The progress of the research in the early years was slow However with the availability of larger computing power and versatile measurement technologies research in all aspects of rotor dynamics has accelerated over the past decades The demand from industry for light weight high performance and reliable rotor bearing systems is the driving force for research and new developments in the field of rotor dynamics The symposium proceedings contain papers on various important aspects of rotor dynamics such as modeling analytical computational and experimental methods developments in bearings dampers seals including magnetic bearings rub impact and foundation effects turbomachine blades active and passive vibration control strategies including control of instabilities nonlinear and parametric effects fault diagnostics and condition monitoring and cracked rotors This volume is of immense value to teachers researchers in educational institutes scientists researchers in R D laboratories and practising engineers in industry

Modeling, Simulation and Control of Nonlinear Engineering Dynamical Systems Jan

Awrejcewicz, 2008-12-26 This volume contains the invited papers presented at the 9th International Conference Dynamical Systems Theory and Applications held in L dz Poland December 17 20 2007 dealing with nonlinear dynamical systems The conference brought together a large group of outstanding scientists and engineers who deal with various problems of dynamics encountered both in engineering and in daily life Topics covered include among others bifurcations and chaos in mechanical systems control in dynamical systems asymptotic methods in nonlinear dynamics stability of dynamical systems lumped and continuous systems vibrations original numerical methods of vibration analysis and man machine interactions Thus the reader is given an overview of the most recent developments of dynamical systems and can follow the newest trends in this field of science This book will be of interest to pure and applied scientists working in the field of nonlinear dynamics

Structural Dynamics Peretz P. Friedmann, George A. Lesieutre, Daning Huang, 2023-02-23 Master structural dynamics with this self contained textbook with key theoretical concepts explained via real world applications

Material and Manufacturing Technology Xie Yi, Li Mi, 2010-08-11 Selected peer reviewed papers from the 2010 International Conference

on Material and Manufacturing Technology ICMMT 2010 held on September 17 19 2010 in Chongqing China *10th International Conference on Vibrations in Rotating Machinery* Institution of Mechanical Engineers, 2012-09-11 This book presents the papers from the 10th International Conference on Vibrations in Rotating Machinery This conference first held in 1976 has defined and redefined the state of the art in the many aspects of vibration encountered in rotating machinery Distinguished by an excellent mix of industrial and academic participation achieved these papers present the latest methods of theoretical experimental and computational rotordynamics alongside the current issues of concern in the further development of rotating machines Topics are aimed at propelling forward the standards of excellence in the design and operation of rotating machines Presents latest methods of theoretical experimental and computational rotordynamics Covers current issues of concern in the further development of rotating machines **Damage Prognosis** Daniel J. Inman, Charles R. Farrar, Vicente Lopes Junior, Valder Steffen Junior, 2005-12-13 Damage prognosis is a natural extension of damage detection and structural health monitoring and is forming a growing part of many businesses This comprehensive volume presents a series of fundamental topics that define the new area of damage prognosis Bringing together essential information in each of the basic technologies necessary to perform damage prognosis it also reflects the highly interdisciplinary nature of the industry through the extensive referencing of each of the component disciplines Taken from lectures given at the Pan American Advanced Studies Institute in Damage Prognosis sponsored by the US National Science Foundation in cooperation with Los Alamos National Laboratories this book will be essential reading for anyone looking to get to grips with the fundamentals of damage prognosis Presents the ground rules for Damage Prognosis Deals with interdisciplinary topics rotating machines aerospace structures automotive components and civil structures Covers essential technical material equations graphs and plots tables and photographs Offers additional material from the associated workshop on an active web site **Fatigue Analysis on Moving Bodies** José Carlos De Carvalho Pereira, 2025-04-15 Fatigue Analysis on Moving Bodies explores dynamic structural analysis of mechanical systems under transient conditions It bridges theoretical foundations with practical applications offering a comprehensive guide for engineers and students alike Beginning with fundamental concepts in Chapters 1 3 the book progresses to advanced topics such as finite element methods and fatigue failure analysis Chapters 4 7 It culminates in Chapter 8 with detailed analyses applicable to real world scenarios like gear trains and vehicle suspensions Key Features Comprehensive coverage of mechanical systems under transient loads Mathematical derivations using Lagrange's equations and energy formulations Application of finite element methods in dynamic analysis In depth exploration of fatigue failure mechanisms and analysis techniques *Computational Methods and Experimental Testing In Mechanical Engineering* Taoufik Boukharouba, Fakhre Chaari, Mounir Ben Amar, Krime Azouaoui, Nourdine Ouali, Mohamed Haddar, 2019-03-12 This book covers a variety of topics in mechanics with a special emphasis to fluid mechanics and energy transfer Chapters are based on selected contributions presented during the Algerian

Congress of Mechanics CAM 2017 held on November 26 30 2017 in Constantine Algeria The book covers theoretical analysis modeling and numerical treatment of performance related problems of new refrigeration systems heating and cooling It reports on experimental research to solve problems related to the flow of microfluids and relevant applications in the areas of chemical engineering biochemistry biomedicine and renewable energy Further topics include methods for maintenance of mechanical structures strength wear fracture damage and life of structures and image processing solutions for the design and 3D manufacturing of mechanical parts Improvement control and regulation of urban road traffic are also discussed in this book thus offering a comprehensive practice oriented reference guide for academics and professionals **Rotating**

Machinery Vibration Maurice L. Adams, 2000-10-24 This comprehensive reference text provides a thorough grounding in the fundamentals of rotating machinery vibration treating computer model building sources and types of vibration and machine vibration signal analysis Illustrating turbomachinery vibration severity levels condition monitoring and rotor vibration cause identification Rotating Machinery Vibration Provides a primer on vibration fundamentals Highlights calculation of rotor unbalance response and rotor self excited vibration Demonstrates calculation of rotor balancing weights Furnishes PC codes for lateral rotor vibration analyses Treats bearing seal impeller and blade effects on rotor vibration Describes modes excitation and stability of computer models Includes extensive PC data coefficient files on bearing dynamics Providing comprehensive descriptions of vibration symptoms for rotor unbalance dynamic instability rotor stator rubs misalignment loose parts cracked shafts and rub induced thermal bows Rotating Machinery Vibration is an essential reference for mechanical chemical design manufacturing materials aerospace and reliability engineers and specialists in vibration rotating machinery and turbomachinery and an ideal text for upper level undergraduate and graduate students in these disciplines Rotating Machinery, Hybrid Test Methods, Vibro-Acoustics & Laser Vibrometry, Volume 8 James De

Clerck, David S. Epp, 2025-08-07 Rotating Machinery Hybrid Test Methods Vibro Acoustics Laser Vibrometry Volume 8 Proceedings of the 34th IMAC A Conference and Exposition on Dynamics of Multiphysical Systems From Active Materials to Vibroacoustics 2016 the eighth volume of ten from the Conference brings together contributions to this important area of research and engineering The collection presents early findings and case studies on fundamental and applied aspects of Structural Dynamics including papers on Processing Modal Data Rotating Machinery Vibro Acoustics Laser Vibrometry Teaching Practices Hybrid Testing Reduced Order Modeling **Mechanical Vibrations** Tomasz Krynski, François Malburet, 2010-01-05 For all rotational machines the analysis of dynamic stresses and the resulting vibrations is an important subject When it comes to helicopters and piston engines this analysis becomes crucial From the design of parts working under stress to the reduction of the vibration levels the success of a project lies mainly in the hands of the dynamicists The authors have combined their talents and experience to provide a complete presentation on the issues involved Part one describes in concrete terms the main dynamic phenomena and how they can be observed in reality Part two presents

information about the modeling methods required to understand the dynamic phenomena and develop solutions capable of eliminating the most serious effects

Rotor Systems Rajiv Tiwari, 2017-11-22 The purpose of this book is to give a basic understanding of rotor dynamics phenomena with the help of simple rotor models and subsequently the modern analysis methods for real life rotor systems This background will be helpful in the identification of rotor bearing system parameters and its use in futuristic model based condition monitoring and fault diagnostics and prognostics The book starts with introductory material for finite element methods and moves to linear and non linear vibrations continuous systems vibration measurement techniques signal processing and error analysis general identification techniques in engineering systems and MATLAB analysis of simple rotors Key Features Covers both transfer matrix methods TMM and finite element methods FEM Discusses transverse and torsional vibrations Includes worked examples with simplicity of mathematical background and a modern numerical method approach Explores the concepts of instability analysis and dynamic balancing Provides a basic understanding of rotor dynamics phenomena with the help of simple rotor models including modern analysis methods for real life rotor systems

Twelve Lectures on Structural Dynamics André Preumont, 2014-07-08 This text addresses the modeling of vibrating systems with the perspective of finding the model of minimum complexity which accounts for the physics of the phenomena at play The first half of the book Ch 1 6 deals with the dynamics of discrete and continuous mechanical systems the classical approach emphasizes the use of Lagrange s equations The second half of the book Ch 7 12 deals with more advanced topics rarely encountered in the existing literature seismic excitation random vibration including fatigue rotor dynamics vibration isolation and dynamic vibration absorbers the final chapter is an introduction to active control of vibrations The first part of this text may be used as a one semester course for 3rd year students in Mechanical Aerospace or Civil Engineering The second part of the text is intended for graduate classes A set of problems is provided at the end of every chapter The author has a 35 years experience in various aspects of Structural dynamics both in industry nuclear and aerospace and in academia he was one of the pioneers in the field of active structures He is the author of several books on random vibration active structures and structural control

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