

# Spectral Method In Multiaxial Random Fatigue Lecture Notes In Applied And Computational Mechanics

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Fatigue of Structures and Materials J. Schijve 2008-12-16 Fatigue of structures and materials covers a wide scope of different topics. The purpose of the present book is to explain these topics, to indicate how they can be analyzed, and how this can contribute to the designing of fatigue resistant structures and to prevent structural fatigue problems in service. Chapter 1 gives a general survey of the topic with brief comments on the significance of the aspects involved. This serves as a kind of a program for the following chapters. The central issues in this book are predictions of fatigue properties and designing against fatigue. These objectives cannot be realized without a physical and mechanical understanding of all relevant conditions. In Chapter 2 the book starts with basic concepts of what happens in the material of a structure under cyclic loads. It illustrates the large number of variables which can affect fatigue properties and it provides the essential background knowledge for subsequent chapters. Different subjects are presented in the following main parts: • Basic chapters on fatigue properties and predictions (Chapters 2–8) • Load spectra and fatigue under variable-amplitude loading (Chapters 9–11) • Fatigue tests and scatter (Chapters 12 and 13) • Special fatigue conditions (Chapters 14–17) • Fatigue of joints and structures (Chapters 18–20) • Fiber-metal laminates (Chapter 21) Each chapter presents a discussion of a specific subject.

Stability and Convergence of Mechanical Systems with Unilateral Constraints Remco I. Leine 2007-12-29 While the stability theory for systems with bilateral constraints is a well-established field, this monograph represents a systematic study of mechanical systems with unilateral constraints, such as unilateral contact, impact and friction. Such unilateral constraints give rise to non-smooth dynamical models for which stability theory is developed in this work. The book will be of interest to those working in the field of non-smooth mechanics and dynamics.

Fatigue and Corrosion in Metals Pietro Paolo Milella 2012-10-05 This textbook, suitable for students, researchers and engineers, gathers the experience of more than 20 years of teaching fracture mechanics, fatigue and corrosion to professional engineers and running experimental tests and verifications to solve practical problems in engineering applications. As such, it is a comprehensive blend of fundamental knowledge and technical tools to address the issues of fatigue and corrosion. The book initiates with a systematic description of fatigue from a phenomenological point of view, since the early signs of submicroscopic damage in few surface grains and continues describing, step by step, how these precursors develop to become mechanically small cracks and, eventually, macrocracks whose growth is governed by fracture mechanics. But fracture mechanics is also introduced to analyze stress corrosion and corrosion assisted fatigue in a rather advanced fashion. The author dedicates a particular attention to corrosion starting with an electrochemical treatment that mechanical engineers with a rather limited knowledge of electrochemistry will well digest without any pain. The electrochemical introduction is considered an essential requirement to the full understanding of corrosion that is essentially an electrochemical process. All stress corrosion aspects are treated, from the generalized film rupture-anodic dissolution process that is the base of any corrosion mechanism to the aggression occurring in either mechanically or thermally sensitized alloys up to the universe of hydrogen embrittlement, which is described in all its possible modes of appearance. Multiaxial fatigue and out-of-phase loading conditions are treated in a rather comprehensive manner together with damage progression and accumulation that are not linear processes. Load spectra are analyzed also in the frequency domain using the Fourier transform in a rather elegant fashion full of applications that are generally not considered at all in fatigue textbooks, yet they deserve a special place and attention. The issue of fatigue cannot be treated without a probabilistic approach unless the designer accepts the shame of one-out-of-two pieces failure. The reader is fully introduced to the most promising and advanced analytical tools that do not require a normal or lognormal distribution of the experimental data, which is the most common case in fatigue. But the probabilistic approach is also used to introduce the fundamental issue of process volume that is the base of any engineering application of fatigue, from the probability of failure to the notch effect, from the metallurgical variability and size effect to the load type effect. Fractography plays a fundamental role in the post mortem analysis of fatigue and corrosion failures since it can unveil the mystery encrypted in any failure.

Physics Briefs 1991

Mechanics of Microstructured Solids J.-F. Ganghoffer 2009-05-14 This is a compendium of reviewed articles presented at the 11th EUROMECH-MECAMAT conference entitled, "Mechanics of

microstructured solids: cellular materials, fibre reinforced solids and soft tissues." It provides all the latest information in the field.

**Advances in Computer Methods and Geomechanics** Amit Prashant 2020-01-14 This volume presents selected papers from IACMAG Symposium, The major themes covered in this conference are Earthquake Engineering, Ground Improvement and Constitutive Modelling. This volume will be of interest to researchers and practitioners in geotechnical and geomechanical engineering.

**Proceedings of SAE-China Congress 2016: Selected Papers** China Society of Automotive Engineers 2017-03-07 This proceedings volume gathers outstanding papers submitted to the 2016 SAE-China Congress, the majority of which are from China, the biggest car maker as well as most dynamic car market in the world. The book includes insights into the current challenges that the whole industry is currently facing, and it offers possible solutions to problems such as emission controls, environmental pollution, the energy shortage, traffic congestion and sustainable development. It also presents the latest technical achievements in the automotive industry. Many of the approaches it presents can help technicians to solve the practical problems that most affect their daily work.

**Large-Scale PDE-Constrained Optimization in Applications** Subhendu Bikash Hazra 2009-12-16 With continuous development of modern computing hardware and applicable - merical methods, computational fluid dynamics (CFD) has reached certain level of maturity so that it is being used routinely by scientists and engineers for flow analysis. Since most of the real-life applications involve some kind of optimization, it has been natural to extend the use of CFD tools from flow simulation to simulation based optimization. However, the transition from simulation to optimization is not straight forward, it requires proper interaction between advanced CFD methodologies and state-of-the-art optimization algorithms. The ultimate goal is to achieve optimal solution at the cost of few flow solutions. There is growing number of search activities to achieve this goal. This book results from my work done on simulation based optimization problems at the Department of Mathematics, University of Trier, and reported in my postdoctoral thesis ("Habilitationsschrift") accepted by the Faculty-IV of this University in 2008. The focus of the work has been to develop mathematical methods and algorithms which lead to efficient and high performance computational techniques to solve such optimization problems in real-life applications. Systematic development of the methods and algorithms are presented here. Practical aspects of implementations are discussed at each level as the complexity of the problems increase, supporting with enough number of computational examples.

**Vibro-Impact Dynamics of Ocean Systems and Related Problems** Raouf A. Ibrahim 2009-05-27 The aim of this International Symposium on Dynamics of Vibro-Impact Systems is to provide a forum for the discussion of recent developments in the theory and industrial applications of vibro-impact ocean systems. A special effort has been made to invite active researchers from engineering, science, and applied mathematics communities. This symposium has indeed updated engineers with recent analytical developments of vibro-impact dynamics and at the same time allowed engineers and industrial practitioners to alert mathematicians with their unresolved issues. The symposium was held in Troy, Michigan, during the period October 1-3, 2008. It included 28 presentations grouped as follows: The first group comprises of nine papers dealing with the interaction of ocean systems with slamming waves and floating ice. It also covers related topics such as sloshing-slamming dynamics, and non-smooth dynamics associated with offshore structures. Moreover, it includes control issues pertaining to marine surface vessels. The second group consists of fifteen papers treats the interaction of impact systems with friction and their control, Hertzian contact dynamics, parameter variation in vibro-impact oscillators, random excitation of vibro-impact systems, vibro-impact dampers, oscillators with a bouncing ball, limiting phase trajectory corresponding to energy exchange between the oscillator and external source, frequency-energy distribution in oscillators with impacts, and discontinuity mapping. The third group is covered in four papers and addresses some industrial applications such as hand-held percussion machines, rub-impact dynamics of rotating machinery, impact fatigue in joint structures.

**Trends in Computational Contact Mechanics** Giorgio Zavarise 2011-06-19 The subject of Computational Contact Mechanics has many facets. Its main impact lies in the transfer of knowledge from theoretical research to applied sciences, and from there to industry. The application fields are literally countless, ranging from classical engineering to biomechanics and nano-sciences. The remarkable increase of computer power in recent years has been instrumental in enabling the development of simulation-based analysis in current design activity. This still involves tremendous effort in research, which focuses on, for example, multi-field and multi-scale problems, algorithmic robustness, and geometrical accuracy. Moreover, several aspects of Contact Mechanics, Debonding and Fracture Mechanics, have been combined to offer new enhanced possibilities to the computer simulation of complex phenomena. With these contributions of prominent scientists, this book offers a wide overview on the ongoing research at the highest level in the field.

**Environmental Engineering** Society of Environmental Engineers (Great Britain) 1965

**Nonlinear Dynamics** Valery N. Pilipchuk 2010-05-09 Nonlinear Dynamics represents a wide interdisciplinary area of research dealing with a variety of "unusual" physical phenomena by means of nonlinear differential equations, discrete mappings, and related mathematical algorithms. However, with no real substitute for the linear superposition principle, the methods of Nonlinear Dynamics appeared to be very diverse, individual and technically complicated. This book makes an attempt to find a common ground for nonlinear dynamic analyses based on the existence of strongly nonlinear but quite simple counterparts to the linear models and tools. It is shown that, since the subgroup of rotations, harmonic oscillators, and the conventional complex analysis generate linear and weakly nonlinear approaches, then translations and reflections, impact oscillators, and hyperbolic (Clifford's) algebras must give rise to some "quasi impact" methodology. Such strongly nonlinear methods are developed in several chapters of this book based on the idea of non-smooth time substitutions. Although most of the illustrations are based on mechanical oscillators, the area of applications may include also electric, electro-mechanical, electrochemical and other physical models generating strongly anharmonic temporal signals or spatial distributions. Possible applications to periodic elastic structures with non-smooth or discontinuous characteristics are outlined in the final chapter of the book.

**Numerics of Unilateral Contacts and Friction** Christian Studer 2009-05-06 Mechanics provides the link between mathematics and practical engineering applications. It is one of the oldest sciences, and many famous scientists have left and will leave their mark in this fascinating field of research. Perhaps one of the most prominent scientists in mechanics was Sir Isaac Newton, who with his "laws of motion" initiated the description of mechanical systems by differential equations. And still today, more than 300 years after Newton, this mathematical concept is more actual than ever. The rising computer power and the development of numerical solvers for differential equations allowed engineers all over the world to predict the behavior of their physical systems fast and easy in a numerical way. And the trend to computational simulation methods is still further increasing, not only in mechanics, but practically in all branches of science. Numerical simulation

will probably not solve the world's engineering problems, but it will help for a better understanding of the mechanisms of our models.

Kinematics and Dynamics of Multibody Systems with Imperfect Joints Paulo Flores 2008-01-10 This book presents suitable methodologies for the dynamic analysis of multibody mechanical systems with joints. It contains studies and case studies of real and imperfect joints. The book is intended for researchers, engineers, and graduate students in applied and computational mechanics.

Crystal Plasticity Finite Element Methods Franz Roters 2011-08-04 Written by the leading experts in computational materials science, this handy reference concisely reviews the most important aspects of plasticity modeling: constitutive laws, phase transformations, texture methods, continuum approaches and damage mechanisms. As a result, it provides the knowledge needed to avoid failures in critical systems under mechanical load. With its various application examples to micro- and macrostructure mechanics, this is an invaluable resource for mechanical engineers as well as for researchers wanting to improve on this method and extend its outreach.

Scientific and Technical Aerospace Reports 1990

Modelling, Simulation and Software Concepts for Scientific-Technological Problems Ernst Stephan 2011-04-28 The book includes different contributions that cover interdisciplinary research in the areas of · Error controlled numerical methods, efficient algorithms and software development · Elastic and in elastic deformation processes · Models with multiscales and multi-physics “High Performance” adaptive numerical methods using finite elements (FEM) and boundary elements (BEM) are described as well as efficient solvers for linear systems and corresponding software components for non-linear, coupled field equations of various branches of mechanics, electromagnetics, and geosciences.

Proceedings of the 14th International Scientific Conference: Computer Aided Engineering Eugeniusz Rusiński 2019-03-09 This book presents the proceedings of the 14th International Conference on Computer Aided Engineering, collecting the best papers from the event, which was held in Wrocław, Poland in June 2018. It includes contributions from researchers in computer engineering addressing the applied science and development of the industry and offering up-to-date information on the development of the key technologies in technology transfer. It is divided into the following thematic sections: • parametric and concurrent design, • advanced numerical simulations of physical systems, • integration of CAD/CAE systems for machine design, • presentation of professional CAD and CAE systems, • presentation of the modern methods of machine testing, • presentation of practical CAD/CAM/CAE applications: – designing and manufacturing of machines and technical systems, – durability prediction, repairs and retrofitting of power equipment, – strength and thermodynamic analyses of power equipment, – design and calculation of various types of load-carrying structures, – numerical methods of dimensioning materials handling and long-distance transport equipment (cranes, gantries, automotive, rail, air, space and other special vehicles and earth-moving machinery), • CAE integration problems. The conference and its proceedings offer a major interdisciplinary forum for researchers and engineers in innovative studies and advances in this dynamic field.

Guide to Load Analysis for Durability in Vehicle Engineering P. Johannesson 2013-08-29 The overall goal of vehicle design is to make a robust and reliable product that meets the demands of the customers and this book treats the topic of analysing and describing customer loads with respect to durability. Guide to Load Analysis for Vehicle and Durability Engineering supplies a variety of methods for load analysis and also explains their proper use in view of the vehicle design process. In Part I, Overview, there are two chapters presenting the scope of the book as well as providing an introduction to the subject. Part II, Methods for Load Analysis, describes useful methods and indicates how and when they should be used. Part III, Load Analysis in view of the Vehicle Design Process, offers strategies for the evaluation of customer loads, in particular characterization of customer populations, which leads to the derivation of design loads, and finally to the verification of systems and components. Key features: • Is a comprehensive collection of methods for load analysis, vehicle dynamics and statistics • Combines standard load data analysis methods with statistical aspects on deriving test loads from surveys of customer usage • Sets the methods used in the framework of system dynamics and response, and derives recommendations for the application of methods in engineering practice • Presents a reliability design methodology based on statistical evaluation of component strength and customers loads • Includes case studies and illustrative examples that translate the theory into engineering practice Developed in cooperation with six European truck manufacturers (DAF, Daimler, Iveco, MAN, Scania and Volvo) to meet the needs of industry, Guide to Load Analysis for Vehicle and Durability Engineering provides an understanding of the current methods in load analysis and will inspire the incorporation of new techniques in the design and test processes.

Vibro-Impact Dynamics Raouf A. Ibrahim 2009-05-12 Studies of vibro-impact dynamics falls into three main categories: modeling, mapping and applications. This text covers the latest in those studies plus selected deterministic and stochastic applications. It includes a bibliography exceeding 1,100 references.

Dynamics of Fluid-structure Systems in the Energy Industry M. K. Au-Yang 1979

Fatigue of Aircraft Structures United States. Naval Air Systems Command 1966

Spectral Method in Multiaxial Random Fatigue Adam Nieslony 2007-09-04 This monograph examines the theoretical foundations of the spectral method for fatigue life determination. The authors discuss a rule of description of random loading states with the matrix of power spectral density functions of the stress/strain tensor components. Some chosen criteria of multiaxial fatigue failure are analyzed. The formula proposed in this book enables readers to determine power spectral density of the equivalent history directly from the components of the power spectral density matrix of the multidimensional stochastic process.

International Aerospace Abstracts 1999

Singular Problems in Shell Theory Evariste Sanchez-Palencia 2010-09-07 This book deals with various aspects in relation with thin shell theory: general geometric formalism of shell theory, analysis of singularities, numerical computing of thin shell problems, mathematical considerations on boundary value problems.

Elastomere Friction Dieter Besdo 2010-03-18

Masonry Constructions: Mechanical Models and Numerical Applications Massimiliano Luchesi 2008-05-13 Many historically and artistically important masonry buildings of the world's architectural heritage are in dire need of maintenance and restoration. In order to optimize such operations in terms of cost-effectiveness, architectural impact

and static effectiveness, accurate models of the structural behavior of masonry constructions are invaluable. The ultimate aim of such modeling is to obtain important information, such as the stress field, and to estimate the extent of cracking and its evolution when the structure is subjected to variations in both boundary and loading conditions. Although masonry has been used in building for centuries, it is only recently that constitutive models and calculation techniques have been available that enable realistic description of the static behavior of structures made of this heterogeneous material whose response to tension is fundamentally different from that to compression. Important insights on the mechanical behavior of masonry arches and vaults come from as far back as Leonardo [10], Hooke [58], Poleni [92] and many other authors (see [47], [9] and [10] for detailed references). Castigliano, in his famous paper on the Mosca bridge [23], and Signorini, in his studies on masonry beams [97], [98], showed both the possibility and necessity of taking into account the weak tensile strength of masonry material.

Elastoplasticity Theory Koichi Hashiguchi 2009-05-02 Recent advancements in the performance of industrial products and structures are quite intense. Consequently, mechanical design of high accuracy is necessary to enhance their mechanical performance, strength and durability. The basis for their mechanical design can be provided through elastoplastic deformation analyses. For that reason, industrial engineers in the fields of mechanical, civil, architectural, aerospace engineering, etc. must learn pertinent knowledge relevant to elastoplasticity. Numerous books about elastoplasticity have been published since "Mathematical Theory of Plasticity", the notable book of R. Hill (1950), was written in the middle of the last century. That and similar books mainly address conventional plasticity models on the premise that the interior of a yield surface is an elastic domain. However, conventional plasticity models are applicable to the prediction of monotonic loading behavior, but are inapplicable to prediction of deformation behavior of machinery subjected to cyclic loading and civil or architectural structures subjected to earthquakes. Elastoplasticity has developed to predict deformation behavior under cyclic loading and non-proportional loading and to describe nonlocal, finite and rate-dependent deformation behavior.

Numerical Methods for Nonsmooth Dynamical Systems Vincent Acary 2008-01-30 This book concerns the numerical simulation of dynamical systems whose trajectories may not be differentiable everywhere. They are named nonsmooth dynamical systems. They make an important class of systems, first because of the many applications in which nonsmooth models are useful, secondly because they give rise to new problems in various fields of science. Usually nonsmooth dynamical systems are represented as differential inclusions, complementarity systems, evolution variational inequalities, each of these classes itself being split into several subclasses. The book is divided into four parts, the first three parts being sketched in Fig. 0. 1. The aim of the first part is to present the main tools from mechanics and applied mathematics which are necessary to understand how nonsmooth dynamical systems may be numerically simulated in a reliable way. Many examples illustrate the theoretical results, and an emphasis is put on mechanical systems, as well as on electrical circuits (the so-called Filippov's systems are also examined in some detail, due to their importance in control applications). The second and third parts are dedicated to a detailed presentation of the numerical schemes. A fourth part is devoted to the presentation of the software platform Siconos. This book is not a textbook on numerical analysis of nonsmooth systems, in the sense that despite the main results of numerical analysis (convergence, order of consistency, etc.) being presented, their proofs are not provided.

Convective Heat and Mass Transfer in Rotating Disk Systems Igor V. Shevchuk 2009-12-01 The book is devoted to investigation of a series of problems of convective heat and mass transfer in rotating-disk systems. Such systems are widespread in scientific and engineering applications. As examples from the practical area, one can mention gas turbine and computer engineering, disk brakes of automobiles, rotating-disk air cleaners, systems of microclimate, extractors, dispensers of liquids, evaporators, circular saws, medical equipment, food process engineering, etc. Among the scientific applications, it is necessary to point out rotating-disk electrodes used for experimental determination of the diffusion coefficient in electrolytes. The system consisting of a fixed disk and a rotating cone that touches the disk by its vertex is widely used for measurement of the viscosity coefficient of liquids. For time being, large volume of experimental and computational data on parameters of flow, heat and mass transfer in different types of rotating-disk systems have been accumulated, and different theoretical approaches to their simulation have been developed. This obviously causes a need of systematization and generalization of these data in a book form.

Structural Health Monitoring Damage Detection Systems for Aerospace Markus G. R. Sause 2021 This open access book presents established methods of structural health monitoring (SHM) and discusses their technological merit in the current aerospace environment. While the aerospace industry aims for weight reduction to improve fuel efficiency, reduce environmental impact, and to decrease maintenance time and operating costs, aircraft structures are often designed and built heavier than required in order to accommodate unpredictable failure. A way to overcome this approach is the use of SHM systems to detect the presence of defects. This book covers all major contemporary aerospace-relevant SHM methods, from the basics of each method to the various defect types that SHM is required to detect to discussion of signal processing developments alongside considerations of aerospace safety requirements. It will be of interest to professionals in industry and academic researchers alike, as well as engineering students.

Deutsche Nationalbibliografie Die deutsche Nationalbibliothek 2008

Mechanics of Random and Multiscale Microstructures Dominique Jeulin 2002-02-06 This book reviews recent theoretical, computational and experimental developments in mechanics of random and multiscale solid materials. The aim is to provide tools for better understanding and prediction of the effects of stochastic (non-periodic) microstructures on materials' mesoscopic and macroscopic properties. Particular topics involve a review of experimental techniques for the microstructure description, a survey of key methods of probability theory applied to the description and representation of microstructures by random modes, static and dynamic elasticity and non-linear problems in random media via variational principles, stochastic wave propagation, Monte Carlo simulation of random continuous and discrete media, fracture statistics models, and computational micromechanics.

The Aerodynamics of Heavy Vehicles II: Trucks, Buses, and Trains Fred Browand 2008-09-30 It is our pleasure to present these proceedings for "The Aerodynamics of Heavy Vehicles II: Trucks, Buses and Trains" International Conference held in Lake Tahoe, California, August 26-31, 2007 by Engineering Conferences International (ECI). Brought together were the world's leading scientists and engineers from industry, universities, and research laboratories, including truck and high-speed train manufacturers and operators. All were gathered to discuss computer simulation and experimental techniques to be applied for the design of the more efficient trucks, buses and high-speed trains required in future years. This was the second conference in the series. The focus of the first conference in 2002 was the interplay between computations and experiment in minimizing aerodynamic drag. The present proceedings, from the 2007 conference, address the development and application of advanced aerodynamic simulation and experimental methods for state-of-the-art analysis and design, as well as the development of new ideas and trends holding

promise for the coming 10-year time span. Also included, are studies of heavy vehicle aerodynamic tractor and trailer add-on devices, studies of schemes to delay undesirable flow separation, and studies of derhood thermal management.

Mechanics of Microstructured Solids 2 J.-F. Ganghoffer 2009-12-02 This second volume of the series Lecture Notes in Applied and Computational Mechanics is the second part of the compendium of reviewed articles presented at the 11th EUROMECH-MECAMAT conference entitled "Mechanics of microstructured solids: cellular materials, fibre reinforced solids and soft tissues", which took place in Torino (Italy) in March 10-14, 2008, at the Museo Regionale delle Scienze. This EUROMECH-MECAMAT conference was jointly organized by the Dipartimento di Matematica dell'Università di Torino, Italy and the INPL Institute (LEMTA, Nancy-Université, France). Prof. Franco Pastrone and Prof. Jean-François Ganghoffer were the co-chairmen.

Vibration Fatigue by Spectral Methods Janko Slavi? 2020-08-20 Vibration Fatigue by Spectral Methods relates the structural dynamics theory to the high-cycle vibration fatigue. The book begins with structural dynamics theory and relates the uniaxial and multiaxial vibration fatigue to the underlying structural dynamics and signal processing theory. Organized in two parts, part I gives the theoretical background and part II the selected experimental research. The time- and frequency- domain aspects of signal processing in general, related to structural dynamics and counting methods are covered in detail. It also covers all the underlying theory in structural dynamics, signal processing, uniaxial & multiaxial fatigue; including non-Gaussianity and non-stationarity.

Finally, it provides the latest research on multiaxial vibration fatigue and the non-stationarity and non-Gaussianity effects. This book is for engineers, graduate students, researchers and industry professionals working in the field of structural durability under random loading and vibrations and also those dealing with fatigue of materials and constructions. Introduces generalized structural dynamics theory of multiaxial vibration fatigue Maximizes understanding of structural dynamics theory in relation to frequency domain fatigue Illustrates connections between experimental work and theory with case studies, cross-referencing, and parallels to accelerated vibration testing

Journal of Pressure Vessel Technology 1980

Finite Element Analysis of Beam-to-Beam Contact Przemyslaw Litewka 2010-04-24 Phenomena occurring during a contact of two bodies are encountered in everyday life. In reality almost every type of motion is related to frictional contact between a moving body and a ground. Moreover, modeling of simple and more complex processes as nailing, cutting, vacuum pressing, movement of machines and their elements, rolling or, finally, a numerical simulation of car crash tests, requires taking contact into account. Therefore, its analysis has been a subject of many research efforts for a long time now. However, it is author's opinion that there are relatively few efforts related to contact between structural elements, like beams, plates or shells. The purpose of this work is to fill this gap. It concerns the beam-to-beam contact as a specific case of the 3D solids contact. A numerical formulation of frictional contact for beams with two shapes of cross-section is derived.

Further, a couple of effective methods for modeling of smooth curves representing beam axes are presented. A part of the book is also devoted to analyze some aspects of thermo-electro-mechanical coupling in contact of thermal and electric conductors. Analyses in every chapter are illustrated with numerical examples showing the performance of derived contact finite elements.

Identification of Damage Using Lamb Waves Zhongqing Su 2009-09-01 Lamb waves are guided waves that propagate in thin plate or shell structures. There has been a clear increase of interest in using Lamb waves for identifying structural damage, entailing intensive research and development in this field over the past two decades. Now on the verge of maturity for diverse engineering applications, this emerging technique serves as an encouraging candidate for facilitating continuous and automated surveillance of the integrity of engineering structures in a cost-effective manner. In comparison with conventional nondestructive evaluation techniques such as ultrasonic scanning and radiography which have been well developed over half a century, damage identification using Lamb waves is in a stage of burgeoning development, presenting a number of technical challenges in application that need to be addressed and circumvented. It is these two aspects that have encouraged us to write this book, with the intention of consolidating the knowledge and know-how in the field of Lamb-wave-based damage identification, and of promoting widespread attention to mature application of this technique in the practical engineering sphere. This book provides a comprehensive description of key facets of damage identification technique using Lamb waves, based on the authors' knowledge, comprehension and experience, ranging from fundamental theory through case studies to engineering applications.

Applied Mechanics Reviews 1993