

MECHANICAL ENGINEERING SERIES

James F. Doyle

Wave Propagation in Structures

Spectral Analysis Using
Fast Discrete Fourier Transforms

Second Edition



Springer

Wave Propagation In Structures Spectral Analysis Using Fast Fourier Transforms

James F. Doyle



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Wave Propagation in Structures James F. Doyle, 2012-12-06 Mechanical engineering an engineering discipline borne of the needs of the industrial revolution is once again asked to do its substantial share in the call for industrial renewal The general call is urgent as we face profound issues of productivity and competitiveness that require engineering solutions among others The Mechanical Engineering Series features graduate texts and research monographs intended to address the need for information in contemporary areas of mechanical engineering The series is conceived as a comprehensive one that covers a broad range of concentrations important to mechanical engineering graduate education and research We are fortunate to have a distinguished roster of consulting editors on the advisory board each an expert in one of the areas of concentration The names of the consulting editors are listed on the facing page of this volume The areas of concentration are applied mechanics biomechanics computational mechanics dynamic systems and control energetics mechanics of materials processing thermal science and tribology

Wave Propagation in Structures James F. Doyle, 2012-12-06 The study of wave propagation seems very remote to many engineers even to those who are involved in structural dynamics I think one of the reasons for this is that the examples usually taught in school were either so simple as to be inapplicable to real world problems or so mathematically abstruse as to be intractable This book contains an approach spectral analysis that I have found to be very effective in analyzing waves What has struck me most about this approach is how I can use the same analytic framework to do predictions as well as to manipulate experimental data As an experimentalist I had found it very frustrating having my analytical tools incompatible with my experiments For example it is experimentally impossible to generate a step function wave and yet that is the type of analytical solution available Spectral analysis is very encompassing it touches on analysis numerical methods and experimental methods I wanted this book to do justice to its versatility so many subjects are introduced As a result some areas may seem a little thin and I regret this But I do hope nonetheless that the bigger picture the unity comes across To encourage you to try the spectral analysis approach I have included complete source code listings to some of the computer programs mentioned in the text

Wave Propagation in Structures James F. Doyle, 2020-12-23 This third edition builds on the introduction of spectral analysis as a means of investigating wave propagation and transient oscillations in structures Each chapter of the textbook has been revised updated and augmented with new material such as a modified treatment of the curved plate and cylinder problem that yields a relatively simple but accurate spectral analysis Finite element methods are now integrated into the spectral analyses to gain further insights into the high frequency problems In addition a completely new chapter has been added that deals with waves in periodic and discretized structures Examples for phononic materials meta materials as well as genuine atomic systems are given

Ultrasonic Waves Auteliano Santos Jr., 2012-03-07 Ultrasonic waves are well known for their broad range of applications They can be employed in various fields of knowledge such as medicine engineering physics biology materials etc

A characteristic presented in all applications is the simplicity of the instrumentation involved even knowing that the methods are mostly very complex sometimes requiring analytical and numerical developments This book presents a number of state of the art applications of ultrasonic waves developed by the main researchers in their scientific fields from all around the world Phased array modelling ultrasonic thrusters positioning systems tomography projection gas hydrate bearing sediments and Doppler Velocimetry are some of the topics discussed which together with materials characterization mining corrosion and gas removal by ultrasonic techniques form an exciting set of updated knowledge Theoretical advances on ultrasonic waves analysis are presented in every chapter especially in those about modelling the generation and propagation of waves and the influence of Goldberg s number on approximation for finite amplitude acoustic waves Readers will find this book ta valuable source of information where authors describe their works in a clear way basing them on relevant bibliographic references and actual challenges of their field of study

High Speed Railway Track Dynamics Xiaoyan Lei,2026-02-19 The third edition of this book systematically summarizes the latest research findings on high speed railway track dynamics over the past decades made by the author and his research team over the past decade It explores cutting edge issues concerning the basic theory of high speed railways covering the dynamic theories models algorithms and engineering applications of the high speed train and track coupling system Presenting original concepts systematic theories and advanced algorithms the book places great emphasis on the precision and completeness of its content The chapters are interrelated yet largely self contained allowing readers to either read through the book as a whole or focus on specific topics It also combines theories with practice to effectively introduce readers to the latest research findings and developments in high speed railway track dynamics It offers a valuable resource for researchers postgraduates and engineers in the fields of civil engineering transportation highway and railway engineering

Modern Mechanics and Applications Nguyen Tien Khiem,Tran Van Lien,Nguyen Xuan Hung,2021-09-06 This proceedings book includes a selection of refereed papers presented at the International Conference on Modern Mechanics and Applications ICOMMA 2020 which took place in Ho Chi Minh City Vietnam on December 2 4 2020 The contributions highlight recent trends and applications in modern mechanics Subjects covered include biological systems damage fracture and failure flow problems multiscale multi physics problems composites and hybrid structures optimization and inverse problems lightweight structures mechatronics dynamics numerical methods and intelligent computing additive manufacturing natural hazards modeling The book is intended for academics including graduate students and experienced researchers interested in recent trends in modern mechanics and application

Poromechanics IV Hoe I. Ling,Andrew Smyth,Raimondo Betti,2009-01-13 Based on the Biot conference named after Maurice Biot and held at Columbia University this book contains over 170 original papers on different phases of poromechanics in many materials from soils and minerals to human bone It covers testing and modeling

Advances in Asset Management and Condition Monitoring Andrew Ball,Len Gelman,B. K. N. Rao,2020-08-27 This book gathers select

contributions from the 32nd International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management COMADEM 2019 held at the University of Huddersfield UK in September 2019 and jointly organized by the University of Huddersfield and COMADEM International The aim of the Congress was to promote awareness of the rapidly emerging interdisciplinary areas of condition monitoring and diagnostic engineering management The contents discuss the latest tools and techniques in the multidisciplinary field of performance monitoring root cause failure modes analysis failure diagnosis prognosis and proactive management of industrial systems There is a special focus on digitally enabled asset management and covers several topics such as condition monitoring maintenance structural health monitoring non destructive testing and other allied areas Bringing together expert contributions from academia and industry this book will be a valuable resource for those interested in latest condition monitoring and asset management techniques

Topics in Nonlinear Dynamics, Volume 3 D. Adams,G. Kerschen,A. Carrella,2012-04-11 *Topics in Nonlinear Dynamics Volume 3* Proceedings of the 30th IMAC A Conference and Exposition on Structural Dynamics 2012 the third volume of six from the Conference brings together 26 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 Application of Nonlinearities Aerospace Structures Nonlinear Dynamics Effects Under Shock Loading Application of Nonlinearities Vibration Reduction Nonlinear Dynamics Testing Nonlinear Dynamics Simulation Nonlinear Dynamics Identification Nonlinear Dynamics Localization

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Computer Modeling in Engineering & Sciences ,2009 *Pavement Mechanics and Performance* Baoshan Huang,2006 GSP 154 contains 36 papers describing the latest advances in pavement mechanics and performance that were presented at sessions of the GeoShanghai Conference held in Shanghai China June 6 8 2006

Proceedings of the ... ASME Design Engineering Technical Conferences ,2000 **Transportation Research Record** ,2000 **Smart Structures and Materials 2003** Shih Chi Liu,2003 **Smart Materials, Structures, and Systems** ,2003 Solution Manual for Mechanics and Control of Robots Krishna C. Gupta,1997-04-24 Intended as an introduction to robot mechanics for students of mechanical industrial electrical and bio mechanical engineering this graduate text presents a wide range of approaches and topics It avoids formalism and proofs but nonetheless discusses advanced concepts and contemporary applications It will thus also be of interest to practicing engineers The book begins with

kinematics emphasizing an approach based on rigid body displacements instead of coordinate transformations it then turns to inverse kinematic analysis presenting the widely used Pieper Roth and zero reference position methods This is followed by a discussion of workplace characterization and determination One focus of the discussion is the motion made possible by spherical and other novel wrist designs The text concludes with a brief discussion of dynamics and control An extensive bibliography provides access to the current literature

Development of a Wireless Instrumented Projectile for Impact Testing Based on Elastic Wave Reduction Guojing Li,2008

Thermal Energy at the Nanoscale Timothy S. Fisher,2014 These lecture notes provide a detailed treatment of the thermal energy storage and transport by conduction in natural and fabricated structures Thermal energy in two carriers i e phonons and electrons are explored from first principles For solid state transport a common Landauer framework is used for heat flow Issues including the quantum of thermal conductance ballistic interface resistance and carrier scattering are elucidated Bulk material properties such as thermal and electrical conductivity are derived from particle transport theories and the effects of spatial confinement on these properties are established

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