
Encyclopedia of Thermal Stresses



Meeting of Section Editors of the Encyclopedia of Thermal Stresses at the 9th International Congress on Thermal Stresses (ICTS) in Budapest on June 8, 2011.

Sitting, from left to right:

Marina V. Shitikova, Voronezh State University of Architecture and Civil Engineering, Russia;
 Piergiovanni Marzocca, Clarkson University, Potsdam, NY, U.S.A.;
 Harry H. Hilton, University of Illinois at Urbana-Champaign, Urbana, IL, U.S.A.
 Richard B. Hetnarski, Rochester Institute of Technology, U.S.A.; Editor-in-Chief of the ETS;
 President of the ICTS organization; Co-Chair of the 9th Int. Congress on Thermal Stresses;
 Andras Szekeres, Budapest University of Technology and Economics, Chair of the 9th
 Int. Congress on Thermal Stresses;
 Naotake Noda, University of Shizuoka, Hamamatsu, Japan; Co-Chair of the 9th Int.
 Congress on Thermal Stresses.

Standing, from left to right:

Theodore R. Tauchert, University of Kentucky, U.S.A.; Secretary General of the ICTS
 organization;
 Fumihiro Ashida, Shimane University, Japan;
 Sei Ueda, Osaka Institute of Technology, Japan;
 Jan Taler, Cracow University of Technology, Poland;
 Yuriy A. Rossikhin, Voronezh State University of Architecture and Civil Engineering, Russia;
 M. Reza Eslami, Amirkabir University of Technology, Tehran, Iran;
 Ching-Kong Chao, National Taiwan University of Science and Technology, Taipei, Taiwan,
 Republic of China;
 Cun-Fa Gao, Nanjing University of Aeronautics and Astronautics, People's Republic
 of China;
 Dorin Iesan, University of Iasi, Romania;
 Stan Chirita, University of Iasi, Romania;
 Vincenzo Tibullo and Vittorio Zampoli, representing Michele Ciarletta, DIIMA, University
 of Salerno, Italy;
 Roman Kushnir, Pidstryhach Institute for Applied Problems of Mechanics and
 Mathematics, National Academy of Sciences of Ukraine, Lviv, Ukraine.

(Photograph taken by Yuriy V. Tokovyy, Pidstryhach Institute for Applied Problems of
 Mechanics and Mathematics, National Academy of Sciences of Ukraine, Lviv, Ukraine).

Richard B. Hetnarski
Editor

Encyclopedia of Thermal Stresses

With 3310 Figures and 371 Tables

 Springer Reference

Editor

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Preface

Doctrina multiplex, veritas una.

The *Encyclopedia of Thermal Stresses* (ETS) is an interdisciplinary reference work. Its main emphasis is on topics in the field of *Thermal Stresses*, but it contains also entries on related topics, such as *Theory of Elasticity*, *Heat Conduction*, *Thermodynamics*, appropriate areas of *Applied Mathematics*, and topics on *Numerical Methods*. The ETS is aimed at both undergraduate and graduate students, researchers and engineers. The creation of such an extensive publication required the effort of the Editorial Board consisting of 29 section editors, experts in their fields of specialization, who represent 15 countries. The hard work of preparation of entries was accomplished by 614 authors, experts in the specific topics, representing 61 countries. The ETS is the largest single publication devoted to the field of *Thermal Stresses* ever published. It contains 11 volumes comprising altogether 6725 pages. Its creation took two-and-a-half years of hard work of devoted section editors, as well as the devoted authors of 708 entries.

The field of Mechanics called *Thermoelasticity* and *Thermal Stresses* was started with the publication, in the year 1837, of the paper by J.-M.-C. Duhamel, *Second Mémoire sur les Phénomènes Thermo-Mécaniques*. Since then, well over 60 published books have been devoted explicitly to this field. The first journal that covers exclusively the subject, the *Journal of Thermal Stresses*, initially a quarterly, and now a monthly, was started in 1978, and the first *International Congress of Thermal Stresses* (which at that time was called a *Symposium*), was held in Hamamatsu, Japan, in 1995. The largest publication on the subject before creation of the ETS, was a set of five volumes entitled *Thermal Stresses*, directed at researchers and engineers. That series, which appeared in the years 1986 to 1999, was edited by this editor and published by Elsevier and Lastran Corporation; it comprised 27 chapters and a total of 2129 printed pages on state-of-the-art level, prepared by specialists. The dates mentioned above were the milestones in the development of the field of *Thermoelasticity* and *Thermal Stresses*. Over the years, the number of papers on the subject that have appeared in the literature has continued to increase, and this growth is an indication of the substantial interest of researchers devoting their time to this field, and of the number of users in industry depending upon this large volume of knowledge.

The ETS contains much of our knowledge on *Thermal Stresses*, including also some textbook information. Thus, the ETS should be useful to readers

with various needs and various levels of preparation. As for the exposition of the material, the effort was directed toward the creation of many entries that are possibly original and new, even if the material itself has been well known for a very long time, which is necessary in order for the ETS to contain also the standard textbook knowledge. But even such information is presented here in more original form, in more original context, and with original illustrations or examples, whenever possible. Also, the ETS contains historical notes, controversial ideas, directions of future research, and – in particular – new ideas, new methods of solutions, and new results. The choice of material in the ETS is geared toward topics containing important developments, with the intention of opening wide perspectives for further expansion of the field of *Thermal Stresses*. Such a mixture is what should make the ETS an especially attractive and precious publication. And the goal of the ETS is not only to inform but also to encourage the young generation to work in the areas of science covered by the ETS.

For the authors, taking part in the creation of the ETS was considered both a privilege and hard work. All involved made an effort to do everything possible to arrive at the best result, as its effects hopefully will be felt for many years. The best specialists were invited to contribute entries. If some of those invited refused to participate, other experts were invited as replacements; however, at the end, not all planned entries found appropriate authors and some entries had to be abandoned.

Many of the authors worked in a close circle of similarly “initiated” colleagues, and if not for the opportunity to write entries for the ETS, they would not come “in the open” and would never write to the wider audience. Offering invitations and receiving acceptance of such invitations by so large a group of specialists was an ambitious effort. As a result, those who use the ETS should consider this publication not only as a source of information, but also as a source of intellectual satisfaction.

Special thanks are extended to Mr. Kevin J. Bradley, President - US Journals, at Taylor & Francis, who was so kind as to offer his approval of granting copyright permissions, without charge, to use the contents of 40 papers published in the *Journal of Thermal Stresses* by their authors in the preparation of the ETS entries. The friendly attitude and generosity of Mr. Bradley contributed to the enrichment of the ETS with the results that otherwise would not be a part of it.

As editor, I express my congratulations and thanks to all who were onboard while the work on the ETS progressed: to the section editors and to the authors, whose names and affiliations may be found on pages that follow. My special thanks are extended to important ladies at Springer: Nathalie Jacobs and Lydia Mueller, who approached me in the spring of 2010 with the offer to undertake the work on the ETS, and to Editors Jutta Jaeger-Hamers, Daniela Graf, and Gabriele Stjepanovic who worked so hard on leading the project from its inception to its conclusion.

October 2013

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Two-Dimensional Problems in Thermo-elastostatics of Anisotropic Solids

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Microstructural Tailoring of Thermal Shock Resistance in Refractory Materials

New Methods for the Assessment of Thermal Shock Resistance in Refractory Materials

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Residual Stresses in Thin Films Evaluated by Different Experimental Techniques

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Thermomechanical Coupling in Plate and Shell Structures – Some Significant Results

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One-Dimensional Transient Heat Conduction in Solid Cylinder

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Thermal Shock Behavior of Ceramic Matrix Composites

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Shaped Metal Deposition Processes

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Hertzian Contact with Heat Flow

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Wave Solutions

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Boundary Element Method in Inverse Heat Conduction Problem Green's Functions in Steady-State Heat Conduction

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Thermoelastic Dynamic Instability (TEDI)

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Thermomechanical Bending in Functionally Graded Material Shells

Simona De Cicco Dipartimento di Strutture per l' Ingegneria e l' Architettura, Università degli Studi di Napoli "Federico II", Napoli, Italy
Problem of Stress Concentration in Elastostatics of Bodies with Microstructure

Singular Surfaces in Thermoviscoelastic Materials with Voids
Variational Principles in the Theory of Elastic Bodies with Microstructure

Vito Antonio Cimmelli Department of Mathematics, Computer Science and Economics, University of Basilicata, Potenza, Italy
Nonequilibrium Temperatures and Second-Sound Propagation Along Nanowires

David L. Clements School of Mathematics, The University of Adelaide, Adelaide, SA, Australia
Anisotropic Thermoelastic Contact Problems

Can Ozgur Colpan Department of Mechanical Engineering, Dokuz Eylul University, Izmir, Turkey
Probability of Failure During the Operation of Direct Internal Reforming Solid Oxide Fuel Cells

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Induction of Thermo-Mechanical Residual Stresses in Metallic Materials by Laser Shock Processing

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Acceleration Waves in Layers of Isotropic Solids at Finite Temperatures

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Thermal Buckling of Beams on Elastic Foundation

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Regularity of Solutions to the Equations of Thermoelasticity

Weizhong Dai College of Engineering and Science, Louisiana Tech University, Ruston, LA, USA
Finite Difference Simulation of Thermal Deformation in Ultrashort-Pulsed Laser Material Processing
Skin Burn Injury Prediction

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Generalized Thermoelastodynamic Stefan Models

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Thermal Stress Under the Effect of Nonconventional Heat Conduction Models

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Piezothermoelastic Analysis: Plate Theories

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*Induction of Thermo-Mechanical Residual Stresses in Metallic Materials
 by Laser Shock Processing*

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*Exact Solution for Classic Coupled Thermoelasticity in Spherical
 Coordinates*

*Exact Solution for Classic Coupled Thermoporoelasticity in Axisymmetric
 Cylinder*

*Exact Solution for Classic Coupled Thermoporoelasticity in Cylindrical
 Coordinates*

*Exact Solution for Lord-Shulman Generalized Coupled
 Thermoporoelasticity in Cylindrical Coordinates*

*Exact Solution for Lord-Shulman Generalized Coupled
 Thermoporoelasticity in Spherical Coordinates*

*Exact Solution for Quasi-Static Porothermoelasticity in Spherical
 Coordinates*

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Thermal Stresses in Hybrid Composite Joints

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Sensitivity Analysis for Thermoelastic State Fields

*Sensitivity of Thermal Response with Respect to Material Parameters and
 Shape of Interfaces and Boundaries*

*Thermal Properties of Homogenized Model of Fiber Reinforced Composite
 Material*

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 University, Chongqing, People's Republic of China

Welding of Dissimilar Metals and Post Weld Heat Treatment

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 "LUCH", Podolsk, Russia

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 Kazakhstan

Influence of Residual Stresses on Fracture at Thermal Loading

*Modeling of Residual Stress Formation on Thermal-Stress Resistance of
 Nuclear Fuel Elements*

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Microstructural Evolution in Heat-Treatable Aluminum Alloys

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*Thermomechanical Inelastic Buckling of Beams Resting on an Elastic
 Foundation*

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Probability of Failure During the Operation of Direct Internal Reforming Solid Oxide Fuel Cells

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Piezothermoelastic Problems: Dynamic Analyses

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Piezothermoelasticity with Hygro-Effects: Fundamental Theory

Piezothermoelasticity: Fundamental Theory

Piezothermoelasticity: Variational Principles

Variational Principles in Coupled Thermoelasticity

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Cracks in Transversely Isotropic and Inhomogeneous Elastic Solids

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Residual in Weld Repairs

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Thermal Stress Analysis of Homogeneous and Laminated Shells by Finite Element Method

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Viscoelastic Wave Propagation

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Thermomechanics of Electroconductive Solids

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Thermal Shock and Thermal Fatigue Study of Ceramic Materials on a Newly Developed Ascending Thermal Shock Test Equipment

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Inverse Determination of Temperature and Thermal Stress Distributions in Solids with Simple and Complex Geometries

Overdetermined Inverse Conduction Problems

Space- and Time-Marching Methods for One-Dimensional Inverse Heat Conduction Problems

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Experimental Analysis of Hot Spotting in Sliding Systems

Janusz Dyszlewicz Faculty of Fundamental Problems of Technology, Institute of Mathematics and Computer Science, Wrocław Technical University, Wrocław, Poland

*Coupled Dynamic Micropolar Problems of Thermoelasticity:
Stress–Temperature Equations of Motion of Ignaczak Type*

Dynamic Micropolar Thermoelasticity

*Selected Problems of Elastostatics and Thermoelastostatics of the
Hemitropic Micropolar Medium*

Piotr Dzierwa Institute of Process and Power Engineering, Cracow University of Technology, Cracow, Poland

Optimum Heating of Pressure Components of Complex Shape

*Quasi-Steady-State Approach for Solving Transient Heat Conduction
Problems*

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Internal State Variables and Thermodynamic Forces

Non-Isothermal Coupled Thermo-Damage-Plasticity

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*Fracture of Elastic-Brittle Bodies at Combined Thermal and Mechanical
Loadings*

*Growing Cracks and Redistribution of Thermal Stresses in
Thermal-Loaded Disk*

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Asymptotic Expansions in Coupled and Generalized Thermoelasticity

Generalized Theory of Thermoelasticity with One Relaxation Time

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Coupled and Generalized Thermoviscoelasticity

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Thermal Stress Caused by Laser Pulse in Functionally Graded Materials

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*Goursat Functions of Thermoelastic Problem of an Infinite Plate with
Hypitrochoidal Hole*

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Experimental Determination of Material Time-Dependent Properties

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Constitutive Models, Physically Based Models for Plasticity

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Acceleration Waves in Nonlinear Thermoelastic Micropolar Media

Ellipticity Condition and Acceleration Waves in Nonlinear Thermoelastic Solids

Phase Transitions in Thermoviscoelastic Shells

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Photoelasticity for the Measurement of Thermal Residual Stresses in Glass

Mohammad Reza Eslami Department of Mechanical Engineering, Amirkabir University of Technology, Tehran, Iran

Circular/Annular Plates, Thermal Buckling

Effect of Creep on Cyclic Loading of Spherical Vessels Based on the Kinematic Hardening Models

Effect of Creep on Thermal Cyclic Loading of Beams Based on the Kinematic Hardening Models

Effect of Creep on Thermal Cyclic Loading of Rotating Disks

Effect of Creep on Thermal Cyclic Loading of Thick Cylindrical Vessels Based on the Kinematic Hardening Models

Effects of Elastic Foundation on Thermal Buckling of Circular/Annular Plates

Effects of Ring Supports on Thermo-Elastic Buckling of Circular Plate

Generalized Thermoelasticity of a Crack Problem Considering Lord-Shulman Theory

Higher-Order Beam Theories

Linear Thermal Buckling of Truncated FGM Conical Shells

Linear Thermal Buckling of Truncated Isotropic Conical Shells with Piezoelectric Layers

Numerical Simulation of Cyclic Loading of Thermal Stresses

Pyroelectric Effect on Dynamic Response of Coupled Distributed Composite Plate

Rings, Thermal Buckling

Slender Beams, Thermal Buckling

Thermal Buckling and Dynamic Post-Buckling Analysis of Piezoelectric FGM Hybrid Cylindrical Shells

Thermal Buckling of Perfect and Imperfect Isotropic Shallow Spherical Shells

Thermal Cyclic Loading of Beams Based on the Chaboche Kinematic Hardening Model

Thermal Cyclic Loading of Beams Based on the Prager and Armstrong-Frederick Kinematic Hardening Models

Thermal Cyclic Loading of Rotating Disks

Thermal Cyclic Loading of Thick Cylindrical Vessels Based on the Prager and Armstrong-Frederick Kinematic Hardening Models

Thermal Cyclic Loading of Thick Spherical Vessels Based on the Prager and Armstrong-Frederick Kinematic Hardening Models

Thermal Effects on Buckling of Cylindrical Shells Surrounded by Pasternak Medium

Thermal Fracture by Extended FEM

Thermal Stresses: First 125 Years of Research (from 1837 to Approximately 1962)

Thermoelastic Buckling of Imperfect FGM Cylindrical Shells

Thermoelastic Stability Analysis of Perfect Isotropic Deep Spherical Shell

Thermoelectrical Buckling and Postbuckling of Functionally Graded Piezoelectric Beams

Thermo-electro-mechanical Buckling of Circular Plates

Thin Cylindrical Shells, Thermal Buckling

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Electromagneto Coupled and Generalized Thermoelasticity

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Thermal Stresses in Flip Chip BGA Packaging

Thermal Stresses in Wafer-Level Packaging

CuiYing Fan Henan Key Engineering Laboratory for Anti-fatigue Manufacturing Technology and the School of Mechanical Engineering, Zhengzhou University, Zhengzhou, People's Republic of China

Extended Displacement Discontinuity Boundary Integral Equation Method for Analysis of Cracks in Smart Materials

Nonlinear Fracture Models of Magnetoelastoelectroelastic Media

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Thermal Shock and Thermal Fatigue Study of Ceramic Materials on a Newly Developed Ascending Thermal Shock Test Equipment

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Aerothermoelastic Behaviors of Functionally Graded Panel Structures

Fluid-Thermal Structural Coupling in the Modeling of Carbon Nanotubes

Fluid-Thermo-Elastic and Aero-Thermo-Elastic Governing Equations for FGM Structures

Fluid-Thermoelastic Behaviors of FGM Thin-Walled Beams and Pipes

Functionally Graded Structures: Aerothermoelastic Interactions

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Heat Conduction and Viscosity as Structuring Mechanisms for Shock Waves in Thermoelastic Materials

Maxwellian Rate-Type Thermo-Viscoelastic Bar Theory: An Approach to Non-monotone Thermoelasticity

Pseudoelasticity and Shape Memory Effect: A Maxwellian Rate-Type Approach

Thermoelastic Bar Theory

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Fourier Transform

Eric Feulvarch Université de Lyon, ENISE, LTDS, UMR 5513 CNRS, Saint-Etienne, France

Modeling and Numerical Simulation of Resistance Spot Welding Process

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Hot Spot Ignition of Explosives and Their Thermal Properties and Experimental Measurement of the Thermal Properties of a PBX and Its Binder System

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Induction Heating

Repair Welding and Local Heat Treatment

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Thermoelasticity of Thin Shells

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Asymptotic Analysis of Heterogeneous Micromorphic Elastic Solids

Gradient Thermoplasticity

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Boundary Element Method in Inverse Heat Conduction Problem

Green’s Functions in Steady-State Heat Conduction

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Thermomechanical Nonlinear Response of Sandwich Panels

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Heterogeneous Media and Their Thermal Properties

Thermal Contact Resistance

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Body Force Analogy for Thermoelasticity

Cătălin Galeş Department of Mathematics, Faculty of Mathematics,
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Continuous Dependence Results

Hamilton–Kirchhoff Principle

Nonlinear Thermoelastic Model

Structural Stability in Linear Thermoelasticity

Uniqueness and Continuous Dependence Results in Nonlinear

Thermoviscoelasticity

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Stress Induced by CO₂ Laser Silica Processing

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Thermo-Inelasticity and Damage

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Inelastic Analysis of Functionally Graded Thermal Barrier Coating

(FG TBC) Under Thermal Shock

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Atomic-Level Hybrid Modeling of Thermomechanical Stress Wave in Metal

Thin Films Induced by Ultrashort Laser Pulses

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Technology, Cracow, Poland

Anisotropic Initial Yield and Failure Criteria Including Temperature

Effect

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Multiphase Porous Media, High Temperature

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Aeronautics, University of Patras, Patras, Greece

Crack Closure

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sity, Athens, Greece

Rapid Sliding Contact: Elastodynamic Steady State

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Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia

Experimental Determination of Material Time-Dependent Properties

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*Thermal Buckling of Perfect and Imperfect Isotropic Shallow Spherical
Shells*

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Area Array Package/Assembly Under Thermal Stress

Column Grid Array Assembly Under Thermal Cycling Stress

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Boundary Integral Formulation of the Plane Problems of

Thermoelastostatics

Coupled Thermoelastostatics in Extended Thermodynamics

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Fluid-Thermal Structural Coupling in the Modeling of Carbon Nanotubes

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Boundary–Initial Value Problems of Thermoelastodynamics

Linear Thermoelastic Model

Partition of Energy

Saint-Venant’s Principle

Thermoelastic Waves

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Induction of Thermo-Mechanical Residual Stresses in Metallic Materials

by Laser Shock Processing

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Mathematical Models of Reissner-Mindlin Thermoelastoplastic Plates

Ordinary Differential Equations (ODE)

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Piezoelectric Materials: Effect of Temperature

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Propagation of Shock Waves in Thermoelastic Solids in View of Singular Surfaces

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Temperature

Thermal Science

Thermodynamic System

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Brittleness Measure of Ceramics

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Computational Welding Mechanics

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Experimental Determination of Material Time-Dependent Properties

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Thermal Stresses in Hybrid Composite Joints

Sławomir Grądział Institute of Thermal Power Engineering, Faculty of Mechanical Engineering, Cracow University of Technology, Cracow, Poland
Energetics
Multidimensional Heat Conduction Problems with Boundary Conditions of the Third Kind

J. A. Greenwood Department of Engineering, University of Cambridge, Cambridge, UK
Surface Temperatures in Sliding

Alexander Grigorenko Timoshenko Institute of Mechanics, National Academy of Sciences of Ukraine, Kiev, Ukraine
Numerical Approaches to Solving Thermoelastic Problems for Inhomogeneous Anisotropic Shells Using Various Models

Yaroslav Grigorenko Timoshenko Institute of Mechanics, National Academy of Sciences of Ukraine, Kiev, Ukraine
Numerical Approaches to Solving Thermoelastic Problems for Inhomogeneous Anisotropic Shells Using Various Models

Viktor T. Grinchenko Institute of Hydromechanics, National Academy of Sciences of Ukraine, Kiev, Ukraine
Finite Elastic Solids, Thermal Stress

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Induction Surface Hardening

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Trefftz Method in Solving Inverse Heat Conduction Problems

Piotr Grzes Faculty of Mechanical Engineering, Białystok University of Technology, Białystok, Poland
FEM-Modeling of Frictional Heating During Braking

Davide Guidetti Dipartimento di Matematica, Università di Bologna, Bologna, Italy
Distributions
Linear Partial Differential Equations: Fundamental Solutions, Hypoellipticity, Local Existence
Operations on Distributions

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Thermal Post-Buckling Paths of Beams

Thermal Post-Buckling Paths of Square Plates

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FGM Plate with Surface Crack, Thermal Shock

Multilayered Method for FGM

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Laser Shock Peening

Sachin Gupta Dynamics Photomechanics Laboratory, Department of Mechanical, Industrial and Systems Engineering, University of Rhode Island, Kingston, RI, USA

Performance of Sandwich Structures Under Dynamic Loads at Different Temperatures

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Dissipative Heating of Thin-Wall Structures Containing Piezoelectric Layers

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Thermomechanics of Electroconductive Solids

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Probability of Failure During the Operation of Direct Internal Reforming Solid Oxide Fuel Cells

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Axisymmetric Generalized Thermoelasticity Problems in Spherical Regions

Axisymmetric Generalized Thermoelasticity Problems Using Cylindrical Coordinates

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Electro-Thermo-Mechanical System: Thermoelastic Damping in Resonators

Davresh Hasanyan Department of Material Science and Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA

Electroconductive Composites Subjected to Magnetoelastic and

Thermomechanical Loadings: Nonlinear Response and Stability

Magneto-thermo-elastic Equations of Thin Electroconductive Isotropic Shells and Plates: Linear Equations

Magneto-Thermoelastic Equations of Thin Electroconductive Isotropic Shells and Plates: Nonlinear Equations

Magneto-Thermo-Elasticity of Laminated Composite Plates Incorporating Structural Nonlinearity

Thermo-Magneto-Electro-Elastic Multilayer Composites: Effective Properties and Magneto-electric Coefficients

Norio Hasebe Department of Civil Engineering, Nagoya Institute of Technology, Showa-ku, Nagoya, Japan

External Force and Displacement Boundary Value Problems

Green's Function of Heat Source for Mixed Boundary Value Problem

Green's Function of Thermoelastic Mixed Boundary Value Problem for Elliptic Hole

Green's Function for Thermal and Mechanical Mixed Boundary Value Problem for an Elliptic Hole

Heat Conduction Problem

Heat Conduction Problem for a Strip with a Notch

Interaction Between a Rigid Inclusion and a Line Crack Under Uniform Heat Flux

Interaction Problem Between a Hole and a Crack

Solution of an Elliptical Rigid Inclusion with Debondings

Thermal Stress for Mixed Heat Conduction Boundary Around an Arbitrarily Shaped Hole Under Uniform Heat Flux

Thermal Stresses Under Electric Current

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Porous Thermoelasticity with Applications

Toshiaki Hata Department of Engineering Education, Faculty of Education, Shizuoka University, Shizuoka City, Japan

One-Dimensional Thermal Stresses in Spheres

Thermal Stress-Focusing Effect

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Modeling Residual Stresses in Friction Stir Welding of Al Alloys

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Thermoelastic Stresses in a Bonded Layer Due to Repetitively Pulsed Laser Radiation

Thermomechanical Growth Instability in Solidification

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Local Thermal Stability of Flanges and Webs

Thermal Flexural-Torsional Stability of Arches

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Pyroelectric Effect on Dynamic Response of Coupled Distributed Composite Plate

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Contact Zone Model for an Interface Crack in a Piezoelectric Bimaterial Under Thermoelctromechanical Loadings

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Coupled Problem of Thermoelasticity: Solution in a Series of Functions Form

Direct Approach to Thermoelasticity

Generalized Thermoelasticity of a Crack Problem Considering Lord-Shulman Theory

Generalized Thermoelasticity: Mathematical Formulation

Laplace Transforms of Specific Exponential Form Encountered in Thermoelasticity

State-Space Approach to Thermoelasticity

Thermal Stresses: First 125 Years of Research (from 1837 to Approximately 1962)

Thermoelastic Stresses in a Bonded Layer Due to Repetitively Pulsed Laser Radiation

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Aeroviscoelasticity Designer FGMs: Passive Control Through Tailored Functionally Graded Materials

Linear Aero-Thermo-Servo-Viscoelasticity, Part I: General Theory

Linear Aero-Thermo-Servo-Viscoelasticity, Part II: Dynamic

Considerations: Lifting Surface and Panel Flutter and Aerodynamic Noise

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Isotropic/Kinematic Hardening in Thermoplasticity

Paul S. Ho Microelectronics Research Center, University of Texas, Austin, TX, USA

Thermal Stress in 3-D Packaging

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Dynamic Fracture Mechanics

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*Aerothermoelastic Behaviors of Functionally Graded Panel Structures
Fluid-Thermo-Elastic and Aero-Thermo-Elastic Governing Equations for
FGM Structures*

*Fluid-Thermoelastic Behaviors of FGM Thin-Walled Beams and Pipes
Functionally Graded Structures: Aerothermoelastic Interactions*

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*Application of Boundary Integral Equation (BIE) Method in
Thermoelastodynamic Problem*

*Application of Meshless Local Petrov-Galerkin (MLPG) and Generalized
Finite Difference (GFD) Methods in Coupled Thermoelasticity Analysis
of Thick Hollow Cylinder*

*Deterministic and Stochastic Coupled Thermoelasticity Analysis in Thick
Hollow Cylinder Subjected to Thermal Shock Loading Using Green-
Naghdi Theory*

*Thermoelastic Wave Propagation Analysis in Thick Hollow Cylinder Based
on Green-Naghdi Theory of Coupled Thermoelasticity Using Analytical
Method*

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*Magneto-electro-thermoelastic Problems: Fundamental Solutions and
Green's Function*

*Thermoelastostatics of Transversely Isotropic Materials: Fundamental
Solutions and Green's Functions*

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Edge Crack, Bimaterial Systems

Edge Crack, Composite Materials

Edge Crack, Isotropic Material

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Thermoelastic Waves in Thin Bodies

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Delamination at Free Edges

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Thermal Stress in 3-D Packaging

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Maysel's Method for Plates

Post-Buckling, Laminated Plates

Stability, Heterogeneous Anisotropic Plates

Chyanbin Hwu Institute of Aeronautics and Astronautics, National Cheng Kung University, Tainan, Taiwan, Republic of China
Stroh Formalism for Thermoelastic Problems

Thomas H. Hyde Department of Mechanical, Materials and Manufacturing Engineering, University of Nottingham, Nottingham, UK
Finite Element Simulation of the Fusion Welding of Metal Components Including Post-weld Heat Treatment

Gianni Luca Iaccarino Applied High-Performance Scientific Computing Research Laboratory, Department of Applied Science, University of Naples "Parthenope", Naples, Italy
Signorini's Method for Live Loads and Second-Order Effects in Elastostatics

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Domain of Influence Theorems in Generalized Thermoelasticity
Generalized Thermoelasticity: Mathematical Formulation

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Thermal Stress in 3-D Packaging

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Eshelby Tensors in Microcontinuum
Identification of Thermo-microstretch Moduli of Materials by the Use of Vibrational Data of Plates

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Foundation of Thermoplasticity
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Welding and Casting: Application of Metallo-thermo-mechanics Part I: Fundamental Framework of the Governing Equations and Simulated Results of Welding Process
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Welding and Casting: Application of Metallo-thermo-mechanics Part III: Centrifugal Casting Process

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Eigenstrains in Thermal Stresses
One-Dimensional Thermal Stresses in Cylinders

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Plane Strain and Plane Stress Problems in Thermoelasticity

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Surface Wave Propagation in a Thermoelastic Half-Space

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Analytical Solution for Two-Dimensional Magneto-thermomechanical Response in FG Hollow Sphere

Exact Solution for Classic Coupled Thermoelasticity in Cylindrical Coordinates

Exact Solution for Classic Coupled Thermoelasticity in Spherical Coordinates

Exact Solution for Classic Coupled Thermoporoelasticity in Axisymmetric Cylinder

Exact Solution for Classic Coupled Thermoporoelasticity in Cylindrical Coordinates

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Mechanical and Thermal Stresses in a FGPM Hollow Cylinder Due to Radially Symmetric loads

Mechanical and Thermal Stresses in a Functionally Graded Hollow Cylinder Due to Nonaxisymmetric Steady-State Loads

Mechanical and Thermal Stresses in a Functionally Graded Hollow Cylinder Due to Radially Symmetric Loads

Thermal and Mechanical Stresses in a Functionally Graded Sphere

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Thermoelastic Stability Analysis of Perfect Isotropic Deep Spherical Shell

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Thermal Contact Applications: Finite Element Formulations

Thermal Contact Applications: Mechanical Contact Models

Thermal Contact Applications: Thermal Contact Models

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Thermomechanical Inelastic Buckling of Beams Resting on an Elastic Foundation

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Functionally Graded Material Minimizes Thermoelastic Instability

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Thermoelastic Instability in Mechanical Systems with Provision for Surface Roughness

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*Measurement of Transient Fluid Temperature
Method of Lines in Heat Conduction*

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Fracture of Electrostrictive Materials

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Global Existence and Exponential Stability in Nonlinear Thermoelasticity

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Thermal Stress in 3-D Packaging

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Crack-Tip Singular Fields in Functionally Graded Materials

Surface Cracks in a Functionally Graded Plate

Thermal Shock Resistance of Functionally Graded Materials

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Higher Order Thermal Buckling of Circular Plates

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Welding of Rails and Effects on Crack Initiation and Propagation

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*Nonequilibrium Temperatures and Second-Sound Propagation Along
Nanowires*

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Technology, Fukaya, Saitama, Japan

Inelastic Simulation Involving in Solid Phase Transformation

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Plates on Elastic Foundation

Shells, Elastic Foundation

Thermally Induced Vibration, Laminated Plates

Thermally Induced Vibration, Orthotropic Plates

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Elasticity and Calculus Mathematics, Donetsk National University, Donetsk,
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Multiply Connected Anisotropic Plates, Thermal Stress

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Nonhomogeneous Solids: Integral Equation Approach

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Generalized Stochastic Perturbation-Based Finite Element Analysis of Structures

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Thermal Shock and Thermal Fatigue Study of Ceramic Materials on a Newly Developed Ascending Thermal Shock Test Equipment

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Coupled Generalized Thermoelasticity of Functionally Graded Materials

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*High-Order Theory, Composite Plates
Thick Plates, Reissner–Mindlin Theory, Statical Problems*

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*Piezothermoelastic Analysis: Discrete Layer Theories
Thermoelectrical Buckling of Beams: Piezoelectric Effects*

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Energy

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Welding Heat Input Models

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Computational Welding Mechanics

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*Forced Harmonic Vibrations and Dissipative Heating of Nonelastic Bodies
Piezothermo-Inelastic Behavior of Structural Elements: Vibrations and
Dissipative Heating*

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Thermal Plastic Ratcheting

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Heat Transfer During Impact

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Analytical Method of FGM

*Nonhomogeneous Plate with Temperature-Dependent Properties, Thermal
Stress*

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Engineering, Tohoku University, Aoba-Ku Sendai, Japan

*Thermal Shock and Thermal Cyclic Fracture Behavior of Metal/Ceramic
Functionally Graded Materials*

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Steady State Heat Flow and Isolated Crack

Steady State Heat Flow into Concentrated Contact

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J_k Integrals for Homogeneous and Bimaterial Bodies

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*Thermoelastic Instability in Mechanical Systems with Provision for
Surface Roughness*

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Circular/Annular Plates, Thermal Buckling

Thermo-electro-mechanical Buckling of Circular Plates

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*Effects of Elastic Foundation on Thermal Buckling of Circular/Annular
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*Effects of Ring Supports on Thermo-Elastic Buckling of Circular Plate
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Slender Beams, Thermal Buckling

*Thermal Effects on Buckling of Cylindrical Shells Surrounded by
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Thin Cylindrical Shells, Thermal Buckling

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*Thermoelastic Stresses in a Bonded Layer Due to Repetitively Pulsed Laser
Radiation*

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Eshelby Tensors in Microcontinuum

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J_k Integrals for Homogeneous and Bimaterial Bodies

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Potential Methods in the Spatial Problems of Heat Conduction and Thermoelasticity for Solids with Cracks

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Thermal Fatigue of Materials for Die Casting Tooling

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Continuous Data Dependence in Linear Theories of Thermoelastodynamics. Part I: Classical Theories. Basics and Logarithmic Convexity

Continuous Data Dependence in Linear Theories of Thermoelastodynamics. Part II: Classical Theories, Lagrange Identity Methods, and Positive-Definite Arguments

Continuous Data Dependence in Linear Theories of Thermoelastodynamics. Part III: Nonclassical Theories Spatial and Structural Stability in Thermoelastostatics

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Singular Stress

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Thermoelectrical Buckling and Postbuckling of Functionally Graded Piezoelectric Beams

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Thermal Stress in MEMS

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Two-Dimensional, Steady-State Conduction
Two-Dimensional, Steady-State Conduction: Tables

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Green's Functions for Inverse Heat Conduction Problems Point, Line, Surface Sources

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Transient Temperature and Thermal Stresses in Turbine Components

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Dual Phase-Lag Thermoelasticity

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Thermoplasticity of Polycrystals

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Thermo-creep Damage in Cu/Al-Alloys

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One-Dimensional Analytical Models of Frictional Heating During Braking

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Piezoelectric Actuation: Control of Linear Thermal Vibrations

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Control of Thermal Residual Stresses

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Dual Phase-Lag Thermoelasticity

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Application of the Generalized Functions Method for Analysis of Thermal Stresses in Piecewise-Homogeneous Solids

Determination of the Thermal Fields and Stresses in Multilayer Solids by Means of the Constructed Green Functions

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Theory and Engineering of Micro-scale Resonators with Low Thermoelastic Dissipation

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Fracture of Elastic-Brittle Bodies at Combined Thermal and Mechanical Loadings

Growing Cracks and Redistribution of Thermal Stresses in Thermal-Loaded Disk

Heating Methods of Testing for Thermal Stress Resistance

Historic Evolution of Thermal Stress Resistance Concept

Influence of Residual Stresses on Fracture at Thermal Loading

Modeling of Residual Stress Formation on Thermal-Stress Resistance of Nuclear Fuel Elements

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Laplace Transform

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***Thermal Stress–Induced Interfacial Failure Modes of Advanced Electronic
Devices***

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Magneto-Thermoelastic Instability: Ferromagnetic Plates

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Perturbation Methods in TEI, Theoretical Analysis

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Thermal Stress in MEMS

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Thermal Stress in Laser-Assisted Machining

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Entropy: The Classical View

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***Microstructural Tailoring of Thermal Shock Resistance in Refractory
Materials***

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Residual Stress Profile in Ceramic Laminates

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Dynamic Micropolar Thermoelasticity

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Thermoelastic Analysis for Duplex Heat Exchanger Tubes

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Electroconductive Composites Subjected to Magnetoelastic and Thermomechanical Loadings: Nonlinear Response and Stability
Magneto-Thermoelastic Equations of Thin Electroconductive Isotropic Shells and Plates: Nonlinear Equations
Thermo-Magneto-Electro-Elastic Multilayer Composites: Effective Properties and Magneto-electric Coefficients

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Thermomechanical Phenomena in Pulsed Laser Powder Deposition

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Linear Friction Welding

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Elastic T-Stresses for a Closed Crack with and Without Kink

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Modeling of Welding of Austenitic Stainless Steels
Welding and Heat Treatment of Alloys
Welding Stresses

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Design Optimization of Turbine Components with the Use of Temperature and Thermal Stresses Objectives

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Crack Detection/Arrest with Joule Heating
Strain Energy Density Factor

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Thermal Stress Migration and Its Role in Electromigration of Microelectronics

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Contact Zone Model for an Interface Crack in a Piezoelectric Bimaterial Under Thermoelctromechanical Loadings

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Hyperbolic Heat Conduction Equation

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Thermal Buckling of Beams on Elastic Foundation

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Multiple Virtual Crack Extension Technique

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Stresses in Laser-Assisted Surface Cleaning

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Effective Fracture Toughness in Al_2O_3 - Al_2O_3 / ZrO_2 -Laminates

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Duhamel's Theorem for Time-Dependent Thermal Boundary Conditions

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Control of Thermal Residual Stresses

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Transient Temperature and Thermal Stresses in Turbine Components

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Heat Treatment of Aluminum Alloys

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Repair Welding and Local Heat Treatment

Shaped Metal Deposition Processes

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Nonhomogeneous Solids: Integral Equation Approach

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Trefftz Method in Solving Inverse Heat Conduction Problems

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Effect of Creep on Cyclic Loading of Spherical Vessels Based on the Kinematic Hardening Models

Effect of Creep on Thermal Cyclic Loading of Beams Based on the Kinematic Hardening Models

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Thermal Cyclic Loading of Thick Spherical Vessels Based on the Prager and Armstrong-Frederick Kinematic Hardening Models

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Numerical Modelling of Underwater Welding and Cutting

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Thermal Buckling Analysis of Orthotropic Nanoplates on Nonlinear Elastic Foundation

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Thermal Stresses in Composite Joints

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Modeling of Residual Stresses with Thermal Cycling

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Thermal Stresses in Solid-Wall Laser IFE Chambers

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Fullerenes: Thermomechanics, Doping, Electrical Conductivity

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Aerothermoelastic Behavior of Flat and Curved Panels

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Thermoelastic Stability of Panels in High-Speed Flows: Linear Analysis
Thermoelastic Stability of Panels in High-Speed Flows: Nonlinear Analysis

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Application of GS4-1 Time Integration Framework to Linear Heat Transfer: Transient Heat Conduction
Application of GS4-1 Time Integration Framework to Nonlinear Heat Transfer: Heat Conduction in Medium with Temperature-Dependent Velocity
Application of Isochronous Integration Framework to Dynamic Thermoelasticity

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Thermal Stresses in Hybrid Composite Joints

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Canonical Formulation of "Nondissipative Thermoelasticity" (with Application to Thermoelastic Fracture)
Canonical Formulation of Thermoelasticity
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Thermoelastic Shock Waves and Phase-Transition Fronts in Terms of Configurational Forces
Thermomechanics of Continua (or Continuum Thermomechanics = CTM)

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Soliton-Like Thermoelastic Waves

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Thermal Stresses at Multi-Material Corners and Cracks in Plastic IC Packages

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Linear Aero-Thermo-Servo-Viscoelasticity, Part I: General Theory
Linear Aero-Thermo-Servo-Viscoelasticity, Part II: Dynamic Considerations: Lifting Surface and Panel Flutter and Aerodynamic Noise

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Mechanical and Thermal Stresses in a FGPM Hollow Cylinder Due to Radially Symmetric loads
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Minimization of Welding Distortions
Welding of Large Structures
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Green's Functions for Inverse Heat Conduction Problems
Point, Line, Surface Sources
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Dynamic Stability of Electroconductive Cylindrical Shells in Magnetic Field
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Numerical Investigation of Magneto-thermoelastic Bending of Superconductive Plate
Thermoelastic Stability of Panels in High-Speed Flows: Linear Analysis
Thermoelastic Stability of Panels in High-Speed Flows: Nonlinear Analysis
Vibrations of Electroconductive Cylindrical Shells in a Magnetic Field
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Thermal Buckling and Dynamic Post-Buckling Analysis of Piezoelectric FGM Hybrid Cylindrical Shells
Thermoelastic Buckling of Imperfect FGM Cylindrical Shells
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Thermomechanical Properties of Shape Memory Polymer
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Thermo-Inelastic Memory of Metals
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Piezoelectric Effects and Materials
- A. H. Mohazzab** Islamic Azad University, Tehran, Iran
Analytical Solution for Two-Dimensional Magneto-thermomechanical Response in FG Hollow Sphere
- Adriano Montanaro** Department of Mathematics, Padova University, Padova, Italy
Kinematics of Singular Surfaces and Jump Equations of Balance
Propagation of Wavefronts in Thermoelastic Media

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Exact Solution for Classic Coupled Thermoelasticity in Cylindrical Coordinates

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Induction of Thermo-Mechanical Residual Stresses in Metallic Materials by Laser Shock Processing

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High-Temperature Creep of Iron Aluminide Intermetallics

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Functions of a Complex Variable: Differentiation and Integration
Functions of a Complex Variable: Series, Residues, and Applications
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Vector and Tensor Analysis: Conservation Equations in Continuum Physics

Vector and Tensor Analysis: Covariant Differentiation

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Vector Spaces and Matrix Algebra: Eigenvalues and Eigenvectors

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Vector Spaces and Matrix Algebra: Vector and Tensor Algebra

Vector Spaces and Matrix Algebra: Vector Spaces

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Sensitivity Analysis for Thermoelastic State Fields
Sensitivity of Thermal Response with Respect to Material Parameters and Shape of Interfaces and Boundaries

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Dual Phase-Lag Thermoelasticity

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Thermodynamics: The Nineteenth-Century History

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Thermal Fatigue in Ceramics

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High-Temperature Creep of Iron Aluminide Intermetallics

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Shape Memory Alloy Composite with Short-Fiber

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Piezothermoelastic Analysis: Finite Element Method

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Local Gradient Thermomechanics

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Higher Order Thermal Buckling of Circular Plates

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Thermal Stresses in Elastic Cylinders and Circular Shells

Thermal Stresses in Microstretch Elastic Cylinders

Variational Principles in the Theory of Elastic Bodies with Microstructure

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Asymptotic Behavior in Time

Existence and Uniqueness: Solutions of Thermoelastodynamics

Mathematical Models of Reissner-Mindlin Thermo-viscoelastic Plates

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Thermodynamics of Thermo-deformable Solids

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Boundary Value Problems of Elastostatics of Hemitropic Solids

Mathematical Problems in Thermoelastostatics of Hemitropic Solids

Thermo-radiating Conditions: Somigliana Type Integral Representations

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Existence of Minimizers in Nonlinear Elastostatics of Micromorphic Solids

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Heat Conduction and Thermoelasticity of Composite Structures

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Inelastic Analysis of Functionally Graded Thermal Barrier Coating

(FG TBC) Under Thermal Shock

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Strength and Failure of High Temperature Superalloys

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Reciprocating Bending Motion of Shape Memory Composite

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Axisymmetric Thermal Stresses in Disks

Axisymmetric Thermal Stresses in Solid Cylinders

Axisymmetric Thermal Stresses in Spheres

Moving Heat Source, Thermal Stresses

Multiply Connected Bodies, Thermal Stresses

One-Dimensional Thermal Stresses in Cylinders

Plane Thermal Stress in Cylinders

Stress Function Method for Plane Problems

Thermal Stresses in Bodies with Temperature-Dependent Properties

Thermal Stress Intensity Factors Due to Thermal Shock

Three-Dimensional Thermal Stresses in Cylinders

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Effect of Thermal Stresses on Crack-Tip Toughness of Polycrystalline Ceramics

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Design Optimization of Turbine Components with the Use of Temperature and Thermal Stresses Objectives

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Transient Heat Conduction in Semi-infinite Solid with Specified Surface Temperature

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Boundary Element Method in Heat Conduction

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Welding Heat Input Models

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Beams, Thermal Stresses

Optimal Design of Functionally Graded Materials

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Induction of Thermo-Mechanical Residual Stresses in Metallic Materials by Laser Shock Processing

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*Finite Element Method in Steady-State and Transient Heat Conduction
Hyperbolic Heat Conduction Equation*

*Mixed Finite Volume and Finite Element Formulation: Linear
Quadrilateral Elements*

*Mixed Finite Volume and Finite Element Formulation: Linear Triangular
Elements*

Transient Heat Conduction in Sphere

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Thermal Stresses in Bars

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Thermal Plastic Ratcheting

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*Thermal Shock and Thermal Fatigue Study of Ceramic Materials on a
Newly Developed Ascending Thermal Shock Test Equipment*

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Warm Forming of Steels for Tailored Microstructure

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Thermal, Mechanical, and Microstructure Couplings

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Effect of Shear Stresses in Thermal Cylindrical Shells

Functionally Graded Cylinder

Inverse Problem of Thermal Deformation in a Cylinder

Piezothermoelastic Functionally Graded Materials

Piezothermoelastic Problems: Static and Quasi-Static Analyses

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Control of Thermal Residual Stresses

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Fundamental Solutions in Classical Thermoelasticity

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Singularities of the Thermo-Magneto-Electro-Elastic Fields

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Thermal Contact Conductance of Rough Surfaces

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Hot Spot Ignition of Explosives and Their Thermal Properties and Experimental Measurement of the Thermal Properties of a PBX and Its Binder System

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Cracks in Transversely Isotropic and Inhomogeneous Elastic Solids Extended Displacement Discontinuity Boundary Integral Equation Method for Analysis of Cracks in Smart Materials Nonlinear Fracture Models of Magnetoelastoelectric Media

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Moving Heat Sources

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Thermal Shock and Thermal Fatigue Study of Ceramic Materials on a Newly Developed Ascending Thermal Shock Test Equipment

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Buckling and Post-Buckling of Composite Plates Under Thermal Loads

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Thermoviscoplasticity at Finite Strains: A Thermoelastic Predictor-Viscoplastic Corrector Algorithm

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Thermal Stresses in Composite Joints

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Spatial Behavior of Solutions

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Jump Function Method and BEM Technique for Determination of Thermal Stresses in Solids with Thin Inclusions

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Thermal Buckling/Postbuckling Characteristics of Laminated Composite Shells

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Thermal Stresses in Flip Chip BGA Packaging

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High-Order Theory, Composite Plates

Thick Plates, Reissner–Mindlin Theory, Statical Problems

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Hygrothermal Effects on Polymeric Composite Materials and Sandwich Structures

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Multiphase Porous Media, High Temperature

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Energy and First Law of Thermodynamics

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Raman Spectroscopic Method for Analyzing Residual Stresses in Ceramic Composites

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Shallow Arches: Thermal Buckling

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Cylindrical Orthotropic Thermoelastic Shells Modeled by Direct Approach

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Phase Transitions in Thermoviscoelastic Shells

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Thermal Shock Resistance of Chromium Carbide-Based Cermets

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Thermal Stress Analysis of Homogeneous and Laminated Shells by Finite Element Method

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Nonlocal Elastic-Damage Models

Shakedown Under Thermomechanical Loads

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Thermoviscoplasticity at Finite Strains: A Thermoelastic

Predictor-Viscoplastic Corrector Algorithm

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Application of the Generalized Functions Method for Analysis of Thermal Stresses in Piecewise-Homogeneous Solids

Methods for Determination of the Thermo-stressed State of

Thermosensitive Solids Under Complex Heat Exchange Conditions

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Induction of Thermo-Mechanical Residual Stresses in Metallic Materials

by Laser Shock Processing

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Manufacturing Thermal Stresses in Composite Components

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Fractional Thermoelasticity

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Heating Methods of Testing for Thermal Stress Resistance

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Damage in Granite Under Temperature Variations

Borys Protsiuk Pidstryhach Institute for Applied Problems of Mechanics and Mathematics, National Academy of Sciences of Ukraine, Lviv, Ukraine

Determination of the Thermal Fields and Stresses in Multilayer Solids by Means of the Constructed Green Functions

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Temperature Characterization in Silicon Wafer by Using Stress Wave as an Indicator

Thermoelastodynamics for Silicon Materials Subjected to Ultrafast Laser Heating

Ultrafast Laser-Induced Thermoelastic Responses in Semiconductors

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Aerothermoelastic Control of Lifting Surfaces

Qing-Hua Qin Research School of Engineering, The Australian National University, Canberra, ACT, Australia

General Solutions for Thermopiezoelectric Materials with Various Openings

Green's Functions of Magneto-Electro-Elastic Plate Under Thermal Loading

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Electroconductive Composites Subjected to Magnetoelastic and

Thermomechanical Loadings: Nonlinear Response and Stability

Magneto-thermo-elastic Equations of Thin Electroconductive Isotropic Shells and Plates: Linear Equations

Magneto-Thermoelastic Equations of Thin Electroconductive Isotropic Shells and Plates: Nonlinear Equations

Magneto-Thermo-Elasticity of Laminated Composite Plates Incorporating Structural Nonlinearity

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Continuous Data Dependence in Linear Theories of

Thermoelastodynamics. Part I: Classical Theories. Basics and Logarithmic Convexity

Continuous Data Dependence in Linear Theories of

Thermoelastodynamics. Part II: Classical Theories, Lagrange Identity Methods, and Positive-Definite Arguments

Continuous Data Dependence in Linear Theories of

Thermoelastodynamics. Part III: Nonclassical Theories Spatial and Structural Stability in Thermoelastostatics

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Post-Buckling of Heated Circular Plates

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Singularities of the Thermo-Magneto-Electro-Elastic Fields

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***Thermal Shock Resistance (TSR) and Thermal Fatigue Resistance (TFR)
of Refractory Materials. Evaluation Method Based on the Dynamic
Elastic Modulus***

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Sweden

Isotropic/Kinematic Hardening in Thermoplasticity

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***Edge Crack, Bimaterial Systems
Edge Crack, Composite Materials
Edge Crack, Isotropic Material***

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***New Methods for the Assessment of Thermal Shock Resistance in
Refractory Materials***

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***Numerical Modelling of Underwater Welding and Cutting
Thermal, Mechanical, and Microstructure Couplings***

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Structures, Voronezh State University of Architecture and Civil Engineering,
Voronezh, Russia

***Boundary-Value Problems Resulting in Thermoelastic Shock Wave
Propagation***

D’Alembert Method in Dynamic Problems of Thermoelasticity

***Harmonic Waves in an Anisotropic Medium Generated by Heat Sources
Distributed Along the Plane***

Hyperbolic Thermoelasticity, Transient Dynamic Contact Problems

Ray Expansion Theory

***Ray Method for Solving Boundary-Value Problems of Anisotropic
Thermoelasticity with Thermal Relaxation***

Thermal Shock upon Thin-Walled Beams of Open Profile

***Transient Thermoelastic Rayleigh Waves on the Surfaces of Bodies of
Revolution***

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Thermal Buckling of Carbon Nanotubes

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Laser-Induced Thermal Splitting in Homogeneous Body with Coating

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Thermal Stress Caused by Laser Pulse in Functionally Graded Materials

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Induction of Thermo-Mechanical Residual Stresses in Metallic Materials by Laser Shock Processing

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Design Optimization of Turbine Components with the Use of Temperature and Thermal Stresses Objectives

Transient Temperature and Thermal Stresses in Turbine Components

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Classical Coupled Thermoelasticity in Unbounded Domains

Linear Elastodynamics in Unbounded Domains

Uniqueness in Linear Elastostatics

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Thermal Stress in 3-D Packaging

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Piezoelectric Actuation: Control of Linear Thermal Vibrations

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Cylindrical Orthotropic Thermoelastic Shells Modeled by Direct Approach

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Thermal Buckling of Plates with Hole

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Body Force Method for Thermoelasticity

Control of Crack Propagation

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Optimization of Thermoelastic Structures

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Cracks in Transversely Isotropic and Inhomogeneous Elastic Solids

Ivan Saprunov Center for Experimental Mechanics, Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia
Experimental Determination of Material Time-Dependent Properties

Radijanka Savova Bulgarian Academy of Sciences, Sofia, Bulgaria
Surface Wave Propagation in a Thermoelastic Half-Space

Antonio Scalia Department of Mathematics and Computer Science, University of Catania, Catania, Italy
Basic Theorems in Thermoelastostatics of Bodies with Microtemperatures
Deformation of Anisotropic Elastic Cylinders with Microstructure
Representations of Solutions in Thermoelasticity Theory

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Hole-Drilling Residual Stress Measurements

Przemyslaw Scherwentke Faculty of Fundamental Problems of Technology, Institute of Mathematics and Computer Science, Wrocław Technical University, Wrocław, Poland
Selected Problems of Elastostatics and Thermoelastostatics of the Hemitropic Micropolar Medium

Bernhard A. Schrefler Department of Civil, Environmental and Architectural Engineering, University of Padova, Padova, Italy
Multiphase Porous Media, High Temperature

Maximilian Schwenk Institute of Applied Materials, Institute of Technology, Karlsruhe, Germany
Transformation Hardening in Steel

Nigel H. Scott School of Mathematics, University of East Anglia, Norwich, UK
Acceleration Wave Propagation in Inhomogeneous Heat-Conducting Rods
Inhomogeneous Plane Waves in Thermoelasticity

Antonio Sellitto Department of Mathematics, Computer Science and Economics, University of Basilicata, Potenza, Italy
Nonequilibrium Temperatures and Second-Sound Propagation Along Nanowires

Igor K. Senchenkov Timoshenko Institute of Mechanics, National Academy of Sciences of Ukraine, Kiev, Ukraine
Modeling of Thermomechanical Process in Growing Viscoplastic Bodies with Accounting of Microstructural Transformation

Mirosław Seredynski Institute of Heat Engineering, Warsaw University of Technology, Warsaw, Poland
Phase Change Heat Transfer Problems

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Green's Functions in Three-Dimensional Thermoelastostatics

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TSR of Hetero-modulus Ceramics

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Thermal Stress in a Multi-leg Thermoelectric Module (TEM) Design

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Thermal Stresses in a Tri-Material Assembly with Application to Silicon-Based Photovoltaic Module (PVM)

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Equation of Phonon Radiative Transport: Formulation and Analysis by the Weighted Residual Method

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Lamb Waves in Homogeneous Isotropic Thermoelastic Plates

Thermoelastic Waves, Homogeneous Isotropic Plates

Wave Propagation in Coupled and Generalized Thermoelastic Media

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Wave-Field in Anisotropic Thermoviscoelastic Media

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Thermal Stress Modeling in Multi-Material Laser Processing

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Thermoelastic Buckling and Postbuckling of Plates on Elastic Foundations

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Curvilinear Cracks

Interaction Between a Heat Source and a Circular Inclusion with a Semi-Infinite Crack

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Piezothermoelasticity with Finite Wave Speeds

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Material Properties of Electronic Packages, Thermal Stresses in On-Chip Metal Interconnects

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Residual Thermal Stress in 2D Orthogonal Plain Weave Fabric Composites

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Axisymmetric Generalized Thermoelasticity Problems in Spherical Regions

Boundary Element Method in Generalized Thermoelasticity

State-Space Approach to Generalized Thermoelasticity

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Computational Methods in Stationary and Nonstationary Thermal-Plasticity Problems

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Generalized Boundary Conditions to Solving Thermal Stress Problems for Bodies with Thin Coatings

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Thermoelastic Contact, Rod Models

Thermoelastic Stresses, Variational Methods

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Equation of Motion: Scalar Formalisms and Theory

Equation of Motion: Vector Formalism and Theory

Explicit Time Integrators and Designs for First-/Second-Order Linear Transient Systems

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Implicit Time Integrators and Designs for Nonlinear Second-Order Systems: N-Body Systems

Implicit Time Integrators and Designs for Nonlinear Second-Order Transient Systems: Elastodynamics

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Boundary-Value Problems Resulting in Thermoelastic Shock Wave Propagation

D'Alembert Method in Dynamic Problems of Thermoelasticity

Harmonic Waves in an Anisotropic Medium Generated by Heat Sources Distributed Along the Plane

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Thermal Shock upon Thin-Walled Beams of Open Profile

Transient Thermoelastic Rayleigh Waves on the Surfaces of Bodies of Revolution

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Thermal Cyclic Loading of Beams Based on the Chaboche Kinematic Hardening Model

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Performance of Sandwich Structures Under Dynamic Loads at Different Temperatures

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Buckling and Post-Buckling of Composite Plates Under Thermal Loads

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Thermoelasticity of Thin Shells

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Limit States and Failure of Elastoplastic Structures Under Thermomechanical Loading

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Thermoelastic Waves at an Interface Between Two Solids

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Hygrothermal Effects on Polymeric Composite Materials and Sandwich Structures

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*Cryogenic Condition, Damage In
Discontinuous Yielding at Cryogenic Temperatures
Ductile Damage at Cryogenic Temperatures*

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Anisotropic Initial Yield and Failure Criteria Including Temperature Effect

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*Application of Boundary Integral Equation (BIE) Method in
Thermoelastodynamic Problem*

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*Application of Boundary Integral Equation (BIE) Method in
Thermoelastodynamic Problem*

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Control of Thermal Residual Stresses

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Modeling of Welding of Austenitic Stainless Steels

Tomasz Sobota Institute of Thermal Power Engineering, Faculty of Mechanical Engineering, Cracow University of Technology, Cracow, Poland

*Energetics
Fourier's Law of Heat Conduction
General Heat Conduction Equation in Various Coordinate Systems*

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*FGM Cones Surrounded by Pasternak-Type Elastic Medium Subjected to
Thermal Load*

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*Mechanical and Thermal Stresses in a Functionally Graded Hollow
Cylinder Due to Nonaxisymmetric Steady-State Loads
Mechanical and Thermal Stresses in a Functionally Graded Hollow
Cylinder Due to Radially Symmetric Loads*

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*Generalized Stochastic Perturbation-Based Finite Element Analysis of
Structures*

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Enhanced Thermal Shock Resistance of Ceramics

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Piezothermoelasticity: Fundamental Equations

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Porous Thermoelasticity with Applications

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Special Functions

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Mechanically Generated Heat

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Uniqueness in Linear Elastostatics

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Computational Methods in Stationary and Nonstationary Thermal-Plasticity Problems

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*Acceleration Waves in Thermoelastic Materials with Voids
Some Remarks on Functional Analysis*

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Soliton-Like Thermoelastic Waves

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Stochastic Analysis of Thermal Stresses in Bodies

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Temperature Characterization in Silicon Wafer by Using Stress Wave as an Indicator

Thermoelastodynamics for Silicon Materials Subjected to Ultrafast Laser Heating

Ultrafast Laser-Induced Thermoelastic Responses in Semiconductors

Ephraim Suhir Department of Electrical Engineering, University of California, Santa Cruz, CA, USA

Analysis of a Prestressed Bi-Material Accelerated-Life-Test (ALT) Specimen

Thermal Stress in a Multi-leg Thermoelectric Module (TEM) Design

Thermal Stresses in a Tri-Material Assembly with Application to Silicon-Based Photovoltaic Module (PVM)

Thermoelastic Stability of an Embedded Nano-fiber

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Jump Function Method and BEM Technique for Determination of Thermal Stresses in Solids with Thin Inclusions

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Characteristic Method of Thermal Stresses

Moving Heat Source, Thermal Stresses

Multiply Connected Bodies, Thermal Stresses

Orthotropic Rectangular Plate with a Rigid Ribbonlike Inclusion, Thermal Stress

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Finite Element Simulation of the Fusion Welding of Metal Components Including Post-weld Heat Treatment

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Piezoelectric Sensors for Application to Thermoelastic Structures

Piezoelectric Smart Structures for Control of Thermoelastic Response

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Reliability of Photoimageable Solder Resists for Electronic Assemblies

when Exposed to Loads Under Continuous Thermal Stress and Thermal Shock Stress

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Basic Theorems in Thermoelastostatics of Bodies with Microtemperatures

Fundamental Solutions in Thermoelasticity Theory

Fundamental Solutions in Thermoelastostatics of Micromorphic Solids

Large Existence of Solutions in Thermoelasticity Theory of Steady Vibrations

Potentials in Thermoelasticity Theory

Representations of Solutions in Thermoelasticity Theory

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Thermo-Hygro-Elasticity (THE)

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Damage in Granite Under Temperature Variations

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Subloop Deformation Properties of Shape Memory Alloy

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Transformation-Induced Plasticity (TRIP)

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Integral Equations

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Finite Volume Method in Heat Conduction

Fins of Rectangular and Hexagonal Geometry

Fins of Straight and Circular Geometry

Optimum Heating of Thick Plane Wall

Superposition Method for Time-Dependent Thermal Boundary Conditions

Surface-Heat Transfer Measurements Using Transient Techniques

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Exact Solution of Inverse Heat Conduction Problems

Finite Element Method in Steady-State and Transient Heat Conduction

Mixed Finite Volume and Finite Element Formulation: Linear

Quadrilateral Elements

Mixed Finite Volume and Finite Element Formulation: Linear Triangular Elements

Monitoring of Thermal Stresses in Pressure Components of Steam Boilers

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Superposition Method for Multidimensional Heat Conduction Problems

Superposition Method for Time-Dependent Thermal Boundary Conditions

Surface-Heat Transfer Measurements Using Transient Techniques

Transient Heat Conduction in Sphere

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Finite Element Simulation of the Fusion Welding of Metal Components Including Post-weld Heat Treatment

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*Dynamic Processes in Thermo-Electro-Magneto-Elastic and Thermo-
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*Method of Asymptotic Separation of Variables in Problems of
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*Method of Averaging in Problems of Thermoelasticity of Composite
Materials*

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Circular Plates, Statical Problems

Energy Method, Anisotropic and Heterogeneous Plates

Energy Method, Homogeneous Isotropic Plates

*Identification of Thermo-microstretch Moduli of Materials by the Use of
Vibrational Data of Plates*

Laminated Plates, Antisymmetric and Nonsymmetric

Laminated Plates, Symmetric

Large Plate Deflections, Berger's Approximation

Large Plate Deflections, von Kármán Theory, Dynamical Problems

Large Plate Deflections, von Kármán Theory, Statical Problems

Maysel's Method for Plates

Plates with Temperature-Dependent Properties

Plates, Anisotropic and Heterogeneous

Plates, Classical Theory

Rectangular Plates, Statical Problems

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Thermal Buckling, Homogeneous Isotropic Plates

Thermally Induced Vibration, Isotropic Plates

Thermally Induced Vibration, Orthotropic Plates

Thick Plates, Energy Method

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*Thermal Stresses at Multi-Material Corners and Cracks in Plastic IC
Packages*

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Local Gradient Thermomechanics

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*Residual Stresses in Thin Films Evaluated by Different Experimental
Techniques*

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Technology, Warsaw, Poland

Impulse Method for Determining Thermal Diffusivity of Solids

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Thermomechanical Nonlinear Response of Sandwich Panels

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Piezothermoelasticity with Finite Wave Speeds

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Harmonic Vibrations in Thermoelastic Cylinders

Spatial Behavior Backward in Time

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Reciprocating Bending Motion of Shape Memory Composite

Subloop Deformation Properties of Shape Memory Alloy

Thermomechanical Properties of Shape Memory Polymer

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Shape Memory Alloy Composite with Short-Fiber

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Nonhomogeneous Solids: Integral Equation Approach

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Linear Thermal Buckling of Truncated FGM Conical Shells

Linear Thermal Buckling of Truncated Isotropic Conical Shells with

Piezoelectric Layers

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Thermodynamics of Machines

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One-Dimensional, Steady-State Heat Conduction

Transient Heat Conduction in Semi-infinite Solid with Surface Convection

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Molecular Dynamics Method for Thermoelasticity

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Modeling Residual Stresses in Friction Stir Welding of Al Alloys

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*Infinite Row of Parallel Cracks in a Piezoelectric Material Strip
Piezoelectric Materials with Multi-Cracks*

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Piezothermoelastic Analysis: Homogenization Modeling

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Acceleration Waves in Layers of Isotropic Solids at Finite Temperatures

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Thermal Buckling of Beams on Elastic Foundation

Thermomechanical Inelastic Buckling of Beams Resting on an Elastic Foundation

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Elastostatics of a Half Space

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Dynamic Processes in Thermo-Electro-Magneto-Elastic and Thermo-Elasto-Diffusive Media

Method of Asymptotic Separation of Variables in Problems of Thermoelasticity

Method of Averaging in Problems of Thermoelasticity of Composite Materials

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Thermal Stresses in Composite Joints

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Thermal Stress Analysis of Homogeneous and Laminated Shells by Finite Element Method

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Electroconductive Composites Subjected to Magnetoelastic and Thermomechanical Loadings: Nonlinear Response and Stability

Magneto-Thermoelastic Equations of Thin Electroconductive Isotropic Shells and Plates: Nonlinear Equations

Thermo-Magneto-Electro-Elastic Multilayer Composites: Effective Properties and Magneto-electric Coefficients

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Brakes, Thermal and Thermoelastic Analysis

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Thermally Induced Deformations in Assembly of FCBGA Packages

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Fundamental Solutions in Classical Thermoelasticity

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Explicit Finite-Difference Method for Solving Transient Heat Conduction Problems

Extended Surfaces (Fins and Pins)

Implicit Finite-Difference Method for Solving Transient Heat Conduction Problems

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Hot Spot Ignition of Explosives and Their Thermal Properties and

Experimental Measurement of the Thermal Properties of a PBX and Its Binder System

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Piezoelectric Materials with Electrodes

Piezoelectric Materials with Penny-Shaped Crack

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Perturbation Solutions of Temperature Distribution of a Plane with a Nearly Circular Inclusion

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Piezothermoelastic Problems: Dynamic Analyses

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High-Frequency Vibrations of Piezoceramic Plates

Surface Acoustic Waves in Finite Piezoceramic Solids

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Stroh Formalism

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Interaction Between a Rigid Inclusion and a Line Crack Under Uniform Heat Flux

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Photoluminescence Piezo-Spectroscopy Method for Measurement of Residual Stresses

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Stresses in Laser Surface Nanostructuring
Thermoelastic Waves Induced by Pulsed Laser Heating

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Global Existence and Exponential Stability in Nonlinear Thermoelasticity
Propagation of Singularities

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Laminated Plates, Interlaminar Stresses

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Thermal Stress in MEMS

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High-Order Theory, Laminated Plate Buckling
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Thermal Stresses at Multi-Material Corners and Cracks in Plastic IC Packages

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Steady State Heat Flow and Isolated Crack
Steady State Heat Flow into Concentrated Contact

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Equation of Phonon Radiative Transport: Formulation and Analysis by the Weighted Residual Method

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Hot Spot Ignition of Explosives and Their Thermal Properties and Experimental Measurement of the Thermal Properties of a PBX and Its Binder System

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Stress Generation in Laser-Material Interaction: Phase Explosion Phenomenon

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Thermomechanics of Diffusive Porous and Granular Materials

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Constitutive Equation for Linear Viscoelastic Materials with Temperature-Dependent Properties

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Transient Heat Conduction in Semi-infinite Solid with Specified Surface Temperature

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Laminated Plates, Antisymmetric and Nonsymmetric Laminated Plates, Symmetric

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Magneto-Thermo-Dynamic Instability of a Beam With Magnetic Fields and Thermal Loads

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Laminated Plates, Interlaminar Stresses

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Aerothermoelastic Behavior of Flat and Curved Panels Aerothermoelastic Behavior of Lifting Surfaces

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Pad Cratering and Role of Thermal Stresses

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Residual Thermal Stress in 2D Orthogonal Plain Weave Fabric Composites

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Magneto-electro-thermoelastic Problems: Fundamental Solutions and Green's Function

Thermoelastostatics of Transversely Isotropic Materials: Fundamental Solutions and Green's Functions

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Thermoelastic Waves Induced by Pulsed Laser Heating

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Plates of Variable Thickness

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Finite Element Simulation of the Fusion Welding of Metal Components Including Post-weld Heat Treatment

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Glass Scribing (Processing) Methods Using Thermal Stresses Induced by Laser Heating

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Determination and Optimization of Stress State of Bodies on the Basis of Inverse Thermoelasticity Problems

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FEM-Modeling of Frictional Heating During Braking
Laser-Induced Thermal Splitting in Homogeneous Body with Coating
One-Dimensional Analytical Models of Frictional Heating During Braking

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Hygrothermally Induced Residual Stresses and Failures in Plastic IC Packages During Reflow Process

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Perturbation Methods in Thermoelastic Instability (TEI) with Finite Element Implementation
Thermoelastic Damping in Resonators

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Thermomechanical Growth Instability in Solidification

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Thermal Stress Development in the Solid Due to Laser Pulse Irradiation: Analytical Approaches for Temperature and Stress Fields

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Thermoelastic Waves in Thin Bodies

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Body Force Method
Body Force Method for Thermoelasticity

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Wave Propagation in the Two-Temperature Theory of Thermoelasticity

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Theory of Pyroelectrics with Finite Wave Speeds

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Thermoelastic Waves Induced by Pulsed Laser Heating

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Thermal Stress in LED Packages for Solid-State Lighting

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Thermal Shock and Modeling of Destruction for Refractory Linings of Metallurgical Installations
Thermal Stress in LED Packages for Solid-State Lighting

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Clutches, Hot Spotting Behavior
Modal Decomposition Methods in TEI

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Generalized Thermoelasticity of a Crack Problem Considering Lord-Shulman Theory
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Asymptotic Partition Backward in Time

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Dynamic Processes in Thermo-Electro-Magneto-Elastic and Thermo-Elasto-Diffusive Media
Method of Asymptotic Separation of Variables in Problems of Thermoelasticity
Method of Averaging in Problems of Thermoelasticity of Composite Materials

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Fracture of Piezoelectric Materials
Strip Dielectric Breakdown Model in Piezoelectric Fracture Mechanics

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Thermal Stress in LED Packages for Solid-State Lighting

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Welding of Large Structures

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Extended Displacement Discontinuity Boundary Integral Equation Method for Analysis of Cracks in Smart Materials

Nonlinear Fracture Models of Magnetoelastoelectric Media

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Cracks in Transversely Isotropic and Inhomogeneous Elastic Solids

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High-Order Theory, Laminated Plate Buckling

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Plates of Variable Thickness

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C- and F-Processes Model and Dynamic Thermoelasticity

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Stresses in Laser-Assisted Surface Cleaning

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Modeling of Residual Stresses with Thermal Cycling

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Raman Spectroscopic Method for Analyzing Residual Stresses in Ceramic Composites

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Dissipative Heating of Thin-Wall Structures Containing Piezoelectric Layers

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Energetics

Multidimensional Heat Conduction Problems with Boundary Conditions of the Third Kind

Space-Marching Method for Two-Dimensional Inverse Heat Conduction Problems

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Two-Dimensional, Steady-State Conduction

Two-Dimensional, Steady-State Conduction: Tables

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Variational Formulation and Nonsmooth Optimization Algorithms in Elastostatic Contact Problems for Cracked Body

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Experimental Determination of Material Time-Dependent Properties

Notations

In part, the adopted system of notations follows that used by R. B. Hetnarski and J. Ignaczak in *The Mathematical Theory of Elasticity*, second edition, CRC Press, Boca Raton, 2011. The system, in turn, is based on M. E. Gurtin, *The Linear Theory of Elasticity*, Encyclopedia of Physics, Chief Editor: S. Flügge, vol. VIa/2, Volume Editor: C. Truesdell, Springer, 1972. In general, scalars are shown as italic light face letters, vectors are denoted by bold lower case letters, second-order tensors and fourth-order tensors appear as bold upper case letters. For example, \mathbf{v} , velocity vector, is a vector with components v_i , \mathbf{S} , stress tensor, is a second-order tensor with components S_{ij} , and \mathbf{C} , elasticity tensor, is a fourth-order tensor with components C_{ijkl} . Alternatively, stresses may be written as σ_{ij} and strains as e_{ij} .

If contributors used the notations as in the list, they did not need to include notation definitions in their entries.

Many contributors, however, used notations of their own, and they defined all symbols in their entries.

List of Symbols

A_{ij}, B_{ij}, C_{ij}	First, second, and third metric tensor of the surface
\mathbf{A}	Beltrami solution, thermal expansion tensor
$\mathbf{A}(\mathbf{m})$	Acoustic tensor for a direction \mathbf{m}
B	Body, Boussinesq's function
\mathbf{C}	Elasticity tensor
D	Torsional rigidity, flexural rigidity, domain, Biot's free energy function
D_i	Electric displacement component
\mathbf{D}	Finite strain tensor
E	Young's modulus
E^3	Three-dimensional Euclidean space
E^2	Two-dimensional Euclidean space
\mathbf{E} or e_{ij}	Infinitesimal strain tensor
\mathbf{E}^\perp	Normal part of \mathbf{E} with respect to a plane
\mathbf{E}^\parallel	Tangential part of \mathbf{E} with respect to a plane
$\varepsilon_E(\mathbf{E})$	Strain energy density of a progressive wave
$\varepsilon_E(\mathbf{E}^\perp)$	Normal strain energy density of a progressive wave
$\varepsilon_S(\mathbf{S})$	Stress energy density of a progressive wave

$\varepsilon_S(\mathbf{S}^\perp)$	Normal stress energy density of a progressive wave
$\varepsilon_S(\mathbf{S}^\parallel)$	Tangential stress energy density of a progressive wave
F	Airy stress function, magnitude of force
\mathbf{F}	Deformation gradient, force
G	Shear modulus, Green's function, gravitational energy, Gibbs thermo-dynamical potential
$H(\cdot)$	Heaviside function
\mathbf{H}	Harmonic second-order tensor field, compatibility related fourth-order tensor
I	Moment of inertia of an area, intrinsic energy per unit volume
I_1, I_2, I_3	Invariants of stress tensor
J	Polar moment of inertia of an area
K	Stress concentration factor
K_r	Displacement concentration factor
$K(t)$	Kinetic energy
\mathbf{K}	Stiffness matrix
L	Length
$L\{f(t)\}$	Laplace transform of $f(t)$
$L^{-1}\{\bar{f}(p)\}$	Inverse Laplace transform of $\bar{f}(p)$
M	Bending moment
$M_{\alpha\beta}$	Bending and twisting moments
\mathbf{M}	Stress–temperature tensor
N	Stress resultant
$N_{\alpha\beta}$	Normal and shear forces
$\mathbf{0}$	Origin, zero vector, zero tensor
P	Part of B , concentrated force
Q	Heat supply field, magnitude of shear force
\mathbf{Q}	Orthogonal tensor
R	Region in E^3 ; distance between two points, radius in spherical coordinate system, normal radius of curvature in shells, heat produced per unit time per unit volume
R, θ, ϕ	Spherical coordinates (θ is in plane x_1, x_2 , and ϕ is between x_3 and R)
\mathbf{R}	Riemann – Christoffel curvature tensor
S	Entropy per unit volume; surface traction
\mathbf{S} or σ_{ij}	Stress tensor
$\widehat{S}(B)$	Mean stress
S^\perp	Normal part of \mathbf{S} with respect to a plane
S^\parallel	Tangential part of \mathbf{S} with respect to a plane
T	Absolute temperature, time interval
T_0	Initial temperature
U	Internal energy, generalized strain energy function
$U_C\{\mathbf{E}\}$	Strain energy
$u(t)$	Total energy of B at time t
V	Vector space associated with E^3
W	Work

W	Rotation tensor
$W(\mathbf{E})$	Stored energy function
$W'(\mathbf{S})$	Complementary strain energy
$\widehat{W}(S)$	Stress energy density
$W_i\{\cdot\}$	Functional involving convolutions
b	Body force
c	Velocity of propagation, specific heat
c_1	Irrotational velocity
c_2	Isochoric velocity
c_σ	Specific heat at constant stress
c_ε	Specific heat at constant strain
$c(\mathbf{S}^0)$	Velocity of a stress progressive wave
e	Unit vector along the axis of symmetry of a transversely isotropic body
e_{ij}	Infinitesimal strain tensor components
e_i	Orthonormal basis (base vectors)
f	Pseudo body force field
g	Galerkin vector field
$g(P)$	Linear momentum of P
h	Thickness of the plate or the shell, height of the beam
$h(P)$	Angular momentum of P
i	$\sqrt{-1}$, function with the values $i(t) = t$, intrinsic energy per unit mass
k	Bulk modulus, polar radius of gyration of a cross section, spring stiffness, thermal conductivity coefficient
i, j, k	Unit vectors along x_1, x_2, x_3 axis, respectively
l	Length
ℓ	Concentrated force
m	Direction of propagation
m	The constant $\frac{1+\nu}{1-\nu}\alpha$, mass of P
n	Outward unit normal on ∂B
p	Pressure, admissible process, elastic process, thermoelastic process
p_i	Pyroelectric coefficient
q	Heat flux
r, θ, z	Cylindrical coordinates
s	Admissible state, elastic state, thermoelastic state, solution
t	Time
u	Displacement
\hat{u}	Prescribed displacement on boundary
u₀	Initial displacement
\dot{u}_0	Initial velocity
$v(B)$	Volume of B
v	Magnitude of velocity
v	Velocity
w	Rigid displacement

x, y, z	Cartesian coordinates
\mathbf{x}, \mathbf{y}	Points in space
x_i	Cartesian components of \mathbf{x}
α	Coefficient of thermal expansion, angle of twist in a tensorial solution of elastodynamics
Γ_{ij}^k	Christoffel's symbol
γ	The constant $(3\lambda + 2\mu)\alpha$
$\delta(\cdot)$	Dirac delta function
δ_{ij}	Kronecker symbol
$\delta v(\mathbf{B})$	Volume change
ϵ_{ijk}	Three-dimensional alternator
$\epsilon_{\alpha\beta}$	Two-dimensional alternator
θ	Temperature change ($= T - T_0$)
i	Dielectric permittivity coefficient
θ_i	Curvilinear coordinates
κ_{ij}	Curvature of the surface
κ	Thermal diffusivity
λ	Lamé modulus, wavelength
μ	Shear modulus
ν	Poisson's ratio
ρ	Density
σ	Magnitude of normal component of a stress vector
σ_{ij}	Stress tensor components
τ	Dimensionless time, magnitude of shear stress
φ	Scalar field in Boussinesq–Papkovitch–Neuber solution, scalar field in Green–Lamé solution
ϕ	Thermoelastic displacement potential, Prandtl's stress function, biharmonic function, electric potential
χ	Biharmonic scalar field in Love's solution
$\boldsymbol{\chi}$	Second-order tensor field of Galerkin type in elastodynamics
ψ	Warping function
$\boldsymbol{\psi}$	Vector field in Boussinesq–Papkovitch–Neuber solution, vector field in Green–Lamé solution
$\boldsymbol{\omega}$	Rotation vector, vector field in a tensorial solution of elastodynamics
\emptyset	Empty set
$\mathbf{1}$	Unit tensor
sym	Symmetric part of a tensor
skw	Skew part of a tensor
tr	Trace of a tensor
\otimes	Tensor product of two vectors
∇	Gradient
$\widehat{\nabla}$	Symmetric gradient
curl	Curl
div	Divergence
Δ, ∇^2	Laplacian
\square_1^2, \square_2^2	Wave operators

$*$	Convolution
$[[\cdot]]$	Jump in a function
da	Element of area
dv	Element of volume
$(\dot{})$	Time derivative
$()^T$	Transpose of a tensor