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Functionally Graded Materials, Technology Leveraged Applications Springer

Automotive textiles represent one of the most valuable international markets for technical textiles. Textile advances in the automotive industry provides an in-depth review of the design and development of automotive textiles and the recent advances made in technical textiles for a variety of automotive applications. Part one discusses issues such as automotive textile requirements from a car producer’s perspective, mapping the automotive textile supply chain, advances in textile fabrics including nonwoven fabrics, and recycling issues. Part two focuses on automotive interiors with chapters on performance and style of interior textiles, materials and design for car seats, and the reduction of interior noise in vehicles. Part three discusses the important safety applications of automotive textiles, including airbags and tyres. Part four concludes by assessing how textiles can be used in automotive bodywork. With its distinguished editor and a team of contributors from both academia and industry, this book is an essential reference for a broad spectrum of readers, ranging from scientists, designers, product development staff to company strategists. Provides an in-depth review of

recent advances in the design and development of automotive textiles Comprehensively examines the automotive textile industry covering key requirements, the supply chain, fabrics and recycling Addresses important safety considerations in automotive textiles including airbags and tyres

Advances in Engineering Materials, Structures and Systems: Innovations, Mechanics and Applications Elsevier

Stability is a basic concern in both design and analysis of load-carrying systems and constitutes a major topic in the field of engineering science and mechanics. Since structural instability may lead to catastrophic failure of engineering structures, stability requirements must be satisfied besides requirements related to material failure. Knowledge on stability is of great importance in the areas of Civil Engineering, Mechanical Engineering and Aerospace Engineering; and all these disciplines have their own literature related to the subject. This book is intended to present state-of-the art in the stability analysis and to bring a number of researches together exposing the advances in the field. It consists of original and innovative research studies exhibiting various investigation directions.

Advances in Computational Stability Analysis Elsevier

With increasing fire accidents in buildings, explosions on critical infrastructures accompanied by increasing development in technology, manufacturing and construction process, the biggest challenge the construction industry, material science, and civil engineering community face these days is the selection of appropriate materials and the study of their responses for extreme loading environment. One of a new class of advanced composite materials recently developed is functionally graded materials (FGMs). FGMs are advanced composite materials characterized by a non-homogeneous material system with a gradual gradation of material property within a given dimension in which two or more materials are mixed with a graded interface. Even though FGMs have been used in the last three decades for aerospace, medicine, defense, energy and optoelectronics, their application in structural components and infrastructures is still in its research stage and in recent years, it has attracted researchers and manufacturers for its potential application under extreme environments such as fire accident and blast. This research has the aim of providing a better understanding, expanding the current knowledge, and investigates this novel composite material for its potential application in thin-walled structural members and systems under extreme loading environment through numerical computations. To achieve these aims, the research was divided into four phases: 1) Investigate both analytical and numerical solutions of FGM structural components (beam and plate) under mechanical loading, 2) Investigate the application of FGMs as a thermal barrier in Cold-Formed Steel (CFS) structural elements, 3) Investigate numerically the response of thin-walled FGM pipes and plates under blast loading and 4) Investigate the performance of large

scale FGM wall systems under extreme loading (fire and blast). Furthermore, optimization of FGM for extreme loading was investigated through a parametric study of FGM material functions (power-law, sigmoid and exponential) and material thickness. Finite element analysis (FEA) using ABAQUS was used to perform the heat transfer and structural responses of the thin-walled structural members/wall system under standard fire conditions, while a Coupled Eulerian-Lagrangian (CEL) was used to investigate the response of FGM plate, pipes and wall system under blast loading. It was observed from results of the research that, FGM sheathing showed better performance in reducing the spread of fire-temperature to CFS member by up to 14% compared to traditional gypsum board in fire exposed flange and increases the collapse moment and failure load by 12% and 18% for CFS beams and columns respectively. Blast response of FGM pipes and plates also resulted in smaller deformation than uniformly graded material. Responses of the FGM sheathed wall system under both fire and blast loading also exhibit better performance as compared with similar configuration with gypsum sheathing. Overall, this research has contributed and demonstrated the potential application of FGMs in thin-walled structural components/systems for the future development of resilient and sustainable structures/infrastructures under extreme loading.

Functionally Gradient Materials Springer Nature This book intend to supply readers with some MATLAB codes for ?nite element analysis of solids and structures. After a short introduction to MATLAB, the book illustrates the ?nite element implementation of some problems by simple scripts and functions. The following problems are discussed: · Discrete systems, such as springs and bars · Beams and frames in bending in 2D and 3D · Plane stress problems · Plates in bending · Free vibration of Timoshenko beams and Mindlin plates, including laminated composites · Buckling of Timoshenko beams and Mindlin plates The book does not intends to give a deep insight into the ?nite element details, just the basic equations so that the user can modify the codes. The book was prepared for undergraduate science and engineering students, although it may be useful for graduate students. TheMATLABcodesofthisbookareincludedinthedisk.Readersarewelcomed to use them freely. The author does not guarantee that the codes are error-free, although a major e?ort was taken to verify all of them. Users should use MATLAB 7.0 or greater when running these codes. Any suggestions or corrections are welcomed by an email to ferreira@fe.up.pt.

Stress Analysis of Functionally Graded Materials Springer Nature Functionally graded materials, a subcategory of Advanced Composite Materials, 1S characterized by variation in microstructure and properties across the thickness of the beam. The unique advantage of Functionally Graded Materials (FGM) is the smooth and continuous change in properties of constituent materials from one layer to its adjacent layer in comparison to sharp changes in material properties as seen in composites. This unique attribute of functionally graded materials thereby,

reduces the stress concentrations, shear and thermal stresses that occur at the interference of layers. Functionally graded materials can, thus, find applications in areas subjected to high mechanical loads and thermal stresses. The scope of this thesis is twofold: first, to study the nonlinear static analysis of FGM beams subjected to uniformly distributed mechanical transverse pressure load with both conventional and unconventional boundary conditions. The conventional boundary conditions considered here, are simply-supported and clamped-clamped with immovable edges, and unconventional boundary conditions considered are translational and rotational springs. The reason for considering unconventional boundary conditions is that in practice, it might be very difficult to achieve rigidly simply-supported or rigidly clamped boundaries. The effect of first order shear deformation theory is also considered. Second, is to study the nonlinear bending analysis of FGM beams subjected to both thermal loads and uniformly distributed mechanical transverse pressure load, for clamped-clamped beams with immovable edges. Volume fraction of component materials is varied using power law across the thickness. Material modeling has been done using two different models, namely: rule of mixtures and Mori-Tanaka model. Nonlinear governing equations were obtained using the von Karmen geometric nonlinearity and first-order shear deformation theory. Results are obtained for variations with different gradation patterns. A few of the obtained results are compared with the Finite Element Results that are obtained using ABAQUS software.

Finite Element Analysis of Mode I Crack Propagation in Layered Functionally Graded Beams Butterworth-Heinemann

This book presents recent advances in the field of computational coupling and contact mechanics with particular emphasis on numerical formulations and methodologies necessary to solve advanced engineering applications. Featuring contributions from leading experts and active researchers in these fields who provide a detailed overview of different modern numerical schemes that can be considered by main numerical methodologies to simulate interaction problems in continuum mechanics. A number of topics are addressed, including formulations based on the finite element method (FEM) and their variants (e.g. isogeometric analysis or standard and generalized high-order FEM: hp-FEM and GFEM, respectively), the boundary element method (BEM), the material point method (MPM) or the recently proposed finite block method (FBM), among many more. Written with PhD students in mind, Advances in Computational Coupling and Contact Mechanics also includes the most recent numerical techniques which could be served as reference material for researchers and practicing engineers. All chapters are self-contained and can be read independently, with numerical formulations accompanied by practical engineering applications. Contents: Frictional Mortar Formulation for Large Inelastic Deformation Problems (T Doca and F M A Pires)Standard and Generalized High-order Mortar-based Finite Elements

in Computational Contact Mechanics (A P C Dias, S P B Proenca and M L Bittencourt)A Large Deformation Frictionless Contact Treatment In NURBS-based Isogeometric Analysis (J Kopa?ka, D Gabriel, R Kolman and J Plesek)Treatment of Non-matching Interfaces in Partitioned Fluid-Structure Interaction Problems (J A González and K C Park)An Eulerian-based Thermo-flexible Multi-body Approach for Simulating Rig Testing of Disc Brakes (N Strömberg)Nonlinear Analysis with Functionally Graded Materials by Finite Block Method (J Li, J Jin, J J Yang, T Huang and P H Wen)A Coupled Finite Element Material Point Method for Large Deformation Problems (Y Lian and X Zhang)Fracture and Contact in the Material Point Method: New Approaches and Applications (M A Homel and E B Herbold)A Cohesive-frictional Grain-boundary Technique for Microstructural Analysis of Polycrystalline Materials (I Benedetti)Piezoelectric and Magneto-electro-elastic Frictional Contact Modelling (L Rodríguez-Tembleque, F C Buroni, A Sáez and M H Ferri Aliabadi) Readership: PhD students in computational mechanics; researchers and practicing engineers. Keywords: Contact Mechanics;Friction; Cohesive-Frictional Contact;Coupling Non-Matching Interfaces;Mortar formulations;Localized Lagrange Multipliers;Isogeometric Contact Analysis;Thermomechanical Contact;Finite Element Method;Finite Block Method;Material Point Method;Multi-Body Approach;Boundary Element Method;Large Inelastic Deformation;Microstructural Analysis of Polycrystalline Materials;Impact Problems;Fragmentation and Comminution Processes;Fluid-Structure Interaction Problems;Disc Brakes Testing;Functionally Graded Materials;Piezoelectric and Magneto-Electro-Elastic MaterialsReview:0

Advances in Mechanics of High-Temperature Materials

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Plated structures are widely used in many engineering constructions ranging from aircraft to ships and from off-shore structures to bridges and buildings. Given their diverse use in severe dynamic loading environments, it is vital that their dynamic behaviour is analysed and understood. Analysis and design of plated structures Volume 2: Dynamics provides a concise review of the most recent research in the area and how it can be applied in the field. The book discusses the modelling of plates for effects such as transverse shear deformation and rotary inertia, assembly of plates in forming thin-walled members, and changing material properties in composite, laminated and functionally graded plates. Various recent techniques for linear and nonlinear vibration analysis are also presented and discussed. The book concludes with a hybrid strategy suitable for parameter identification of plated structures and hydroelastic analysis of floating plated structures. With its distinguished editors and team of international contributors, Analysis and design of plated structures Volume 2: Dynamics is an invaluable reference source for engineers, researchers and academics involved in the analysis and design of plated structures. It also provides a companion volume to Analysis and design of plated structures Volume 1: Stability. The second of two volumes on plated structures Provides a concise review of the most recent research in the research of plated structures Discusses modelling of plates for specific effects

The Finite Element Method Stress Analysis of Functionally Graded MaterialsA functionally graded material (FGM) is an in homogeneous material whose material properties vary continuously. Since

FGM's material properties are continuous at the interface of the two materials, unlike conventional composites whose material properties are discontinuous at the interface, it is best suited to prevent catastrophically failure, stress concentration, and residual stresses.Literature reviews revealed that most of the research on FGMs was a 2-D analysis, especially on FGM plates and beams. This research focuses on 3-D stress analysis for an elastic medium that contains a spherical inclusion made of an FGM embedded in a matrix phase. To the best of my knowledge and literature surveys, this is the first attempt to analyze inclusion-type FGMs semi-analytically. The material properties are assumed to vary linearly, which is suitable for a solid or hollow FGM sphere,although this assumption can be relaxed to the exponential or power-law variations.I have considered three different scenarios, which are (1) 3-D thermal stress analysis of an infinitely extended medium which contains a spherical FGM inclusion with a constant heat source in the FGM inclusion, (2) 3-D thermal stress analysis of an infinitely extended medium which contains a spherical FGM inclusion subject to constant heat flux at the far fields, and (3) 3-D elastic stress analysis of an infinitely extended medium which contains a spherical FGM inclusion subject to constant strain at the far fields. Each one of them is discussed separately.The 3-D temperature distribution is sought in the heat source problem due to the constant heat source in the inclusion, and the 3-D heat conduction equation was solved analytically. The material properties of Ni-ceramic are taken as an example, and I plotted the graph of temperature distribution. It is found that the graph is smooth at the interface of FGM-matrix, unlike the two-phase conventional composites,where there is an abrupt change in the slope at the interface. Furthermore, this temperature distribution is substituted into the elasticity equation to solve Navier's equation of displacement. The stress equilibrium equation is converted into a second order ordinary differential equation using tensor analysis. A computer algebra tool, Mathematica, was used to solve the differential equation to obtain the exact solution.However, the output was too lengthy and not practically useful. Therefore, I have adopted the least square method and plotted the results. The least square method is used to solve the differential equation because of its simplicity. The results are then compared with previously published articles, where they give an excellent comparison.It has also been shown that the von Mises stress is continuous at the interface of the FGM-matrix medium, unlike the two-phase conventional composites where there is a considerable gap at the interface.In the heat flux problem, the same approach has been used as in the heat source problem I have considered. The only difference is that the temperature distribution is not due to the heat source but due to the constant heat flux at the far fields. I obtained the exact solution of the 3-D heat conduction equation, and the result of temperature distribution is plotted using the material properties of glass-ceramic.The temperature distribution is substituted in the stress equilibrium equation, and Mathematica is employed to solve the differential

equation analytically. However, the set of two simultaneous differential equations are not solvable analytically. Again, have adopted the least square method and plotted the results. The results are then compared with the two-phase conventional composite.In the constant strain problem, the same approach is used as in the heat flux problem I have considered, but instead of considering constant heat flux at the far fields, constant strain at the far fields is considered. Here, the total strain is decomposed into the deviatoric and the hydrostatic strains. Both of them are analyzed separately. In the 3-D stress analysis due to the hydrostatic strain, I obtained the exact solution for the stress equilibrium equation, plotted the results, and compared it with the two phase conventional composites. 3-D stress analysis due to the deviatoric strain is also performed by solving the stress equilibrium equation using the least square method.The results are shown and compared with the two-phase conventional composites.Based on the temperature field I obtained in the heat flux problem, the effective thermal conductivity is derived using the self-consistent method and compared with the Voigt-Reuss upper and lower bounds. As a result, the curve lies within the upper and lower bounds. The solution obtained in this research can be directly used to assess the performance of composites where multiple FGM-made inclusions are distributed in a matrix phase.Finite element tools such as Ansys or Abaqus are not suitable for this research because they cannot handle the continuous variation of the material properties. Also,they cannot handle an infinitely extended matrix.Trends in Welding Research

This book offers a collection of original peer-reviewed contributions presented at the 8th International Congress on Design and Modeling of Mechanical Systems (CMSM'2019), held in Hammamet, Tunisia, from the 18th to the 20th of March 2019. It reports on research, innovative industrial applications and case studies concerning mechanical systems and related to modeling and analysis of materials and structures, multiphysics methods, nonlinear dynamics, fluid structure interaction and vibroacoustics, design and manufacturing engineering. Continuing on the tradition of the previous editions, these proceedings offers a broad overview of the state-of-the art in the field and a useful resource for academic and industry specialists active in the field of design and modeling of mechanical systems. CMSM'2019 was jointly organized by two leading Tunisian research laboratories: the Mechanical Engineering Laboratory of the National Engineering School of Monastir, University of Monastir and the Mechanical, Modeling and Manufacturing Laboratory of the National Engineering School of Sfax, University of Sfax.

MATLAB Codes for Finite Element Analysis Routledge

This book reports on recent findings and applications relating to structure modeling and computation, design methodology, advanced manufacturing, mechanical behavior of materials, fluid mechanics, energy, and heat transfer. Further, it highlights cutting-edge issues in biomechanics and mechanobiology, and describes simulation and intelligent techniques applied to the control of industrial processes. Chapters are based on a selection of original peer-

reviewed papers presented at the 5th International Tunisian Congress on Mechanics, COTUME, which was held on March 22–24, 2021, from Hammamet, Tunisia, in hybrid format. All in all, the book offers a good balance of fundamental research and industrially relevant applications, and an in-depth analysis of the current state of the art and challenges in various subfields of mechanical engineering; it provides researchers and professionals with a timely snapshot and a source of inspiration for future research and collaborations.

JPRS Report Springer Nature

Written for practicing engineers and students alike, this book emphasizes the role of finite element modeling and simulation in the engineering design process. It provides the necessary theories and techniques of the FEM in a concise and easy-to-understand format and applies the techniques to civil, mechanical, and aerospace problems. Updated throughout for current developments in FEM and FEM software, the book also includes case studies, diagrams, illustrations, and tables to help demonstrate the material. Plentiful diagrams, illustrations and tables demonstrate the material Covers modeling techniques that predict how components will operate and tolerate loads, stresses and strains in reality Full set of PowerPoint presentation slides that illustrate and support the book, available on a companion website

Shell Structures: Theory and Applications ASM International

Stress Analysis of Functionally Graded Materials

Proceedings of the ASME Aerospace Division Springer Nature

This book presents select proceedings of the International Conference on Evolution in Manufacturing (ICEM 2020), and examines a range of areas including internet-of-things for cyber manufacturing, data analytics for manufacturing systems and processes and materials. The topics covered include modeling simulation and decision making in cyber physical systems for supporting engineering and production management, innovative approach in materials development, biomaterial applications, and advancement in manufacturing and material technologies. The book also discusses sustainability in manufacturing and supply chain management including circular economy. The book will be a valuable reference for beginners, researchers, and professionals interested in smart manufacturing in engineering, production management and materials technology.

Advances in Mechanical Problems of Functionally Graded Materials and Structures Springer Nature

Advances in Engineering Materials, Structures and Systems: Innovations, Mechanics and Applications comprises 411 papers that were presented at SEMC 2019, the Seventh International Conference on Structural Engineering, Mechanics and Computation, held in Cape Town, South Africa, from 2 to 4 September 2019. The subject matter reflects the broad scope of SEMC conferences, and covers a wide variety of engineering materials (both traditional and innovative) and many types of structures. The many topics featured in these Proceedings can be classified into six broad categories that deal with: (i) the mechanics of materials and fluids (elasticity, plasticity, flow through porous media, fluid dynamics, fracture, fatigue, damage, delamination, corrosion, bond, creep, shrinkage, etc); (ii) the mechanics of structures and systems (structural dynamics, vibration, seismic response, soil-structure interaction, fluid-structure interaction, response to blast

and impact, response to fire, structural stability, buckling, collapse behaviour); (iii) the numerical modelling and experimental testing of materials and structures (numerical methods, simulation techniques, multi-scale modelling, computational modelling, laboratory testing, field testing, experimental measurements); (iv) innovations and special structures (nanostructures, adaptive structures, smart structures, composite structures, bio-inspired structures, shell structures, membranes, space structures, lightweight structures, long-span structures, tall buildings, wind turbines, etc); (v) design in traditional engineering materials (steel, concrete, steel-concrete composite, aluminium, masonry, timber, glass); (vi) the process of structural engineering (conceptualisation, planning, analysis, design, optimization, construction, assembly, manufacture, testing, maintenance, monitoring, assessment, repair, strengthening, retrofitting, decommissioning). The SEMC 2019 Proceedings will be of interest to civil, structural, mechanical, marine and aerospace engineers. Researchers, developers, practitioners and academics in these disciplines will find them useful. Two versions of the papers are available. Short versions, intended to be concise but self-contained summaries of the full papers, are in this printed book. The full versions of the papers are in the e-book.

Analysis and Design of Plated Structures CRC Press

There are some books that target the theory of the finite element, while others focus on the programming side of things. Introduction to Finite Element Analysis Using MATLAB® and Abaqus accomplishes both. This book teaches the first principles of the finite element method. It presents the theory of the finite element method while maintaining a balance between its mathematical formulation, programming implementation, and application using commercial software. The computer implementation is carried out using MATLAB, while the practical applications are carried out in both MATLAB and Abaqus. MATLAB is a high-level language specially designed for dealing with matrices, making it particularly suited for programming the finite element method, while Abaqus is a suite of commercial finite element software. Includes more than 100 tables, photographs, and figures Provides MATLAB codes to generate contour plots for sample results Introduction to Finite Element Analysis Using MATLAB and Abaqus introduces and explains theory in each chapter, and provides corresponding examples. It offers introductory notes and provides matrix structural analysis for trusses, beams, and frames. The book examines the theories of stress and strain and the relationships between them. The author then covers weighted residual methods and finite element approximation and numerical integration. He presents the finite element formulation for plane stress/strain problems, introduces axisymmetric problems, and highlights the theory of plates. The text supplies step-by-step procedures for solving problems with Abaqus interactive and keyword editions. The described procedures are implemented as MATLAB codes and Abaqus files can be found on the CRC Press website.

Advances In Computational Coupling And Contact Mechanics Butterworth-Heinemann

"This thesis contains three papers that focus on composites that pertain to a variety of structures commonly found in the aerospace industry. The first paper presents an investigation of the stowage and deployment strength of a thin carbon fiber-reinforced polymer shell capable of being rolled and stowed in a tight rolled configuration. The intent of this structure is for use as a segment of a

larger deployable reflective aperture. This study involved finite element analysis of several laminates, coupon-level and full-scale prototype testing, which provided a much needed insight and benchmark of composite shells used in this manner. The second paper outlines the principles and mathematical backgrounds of functionally graded materials (FGM) in engineering, as well as a review of representative recent studies of such materials. Additionally contained in this paper is an example that demonstrates the advantages FGM structures can provide. This example involves the optimization of a sandwich plate with in-surface graded facings to increase the bucking load and fundamental frequency without any weight penalty. This study was performed by interfacing the commercial finite element code Abaqus, with the Sandia National Laboratories developed optimization toolkit DAKOTA. The third paper focuses on energy harvesting using a flextensional bimorph. In this paper, a new concept of utilizing piezoelectric bimorph harvesters in combination with a flextensional strain amplifier is featured. To demonstrate the energy harvesting capabilities using this concept, a nonlinear finite element analysis of the bimorph harvester was conducted. As follows from the analysis, the new concept offers a possibility to harvest energy in a broad spectrum of driving frequencies, eliminating the major weakness of standard bimorphs related to a narrow useful frequency range. The papers contained in this thesis have displayed significant advancements to their respective application. The concepts and solutions considered in the papers offer significant possibilities for a development of advance aerospace structures"--Abstract, leaf iv.

Textile Asia Springer Science & Business Media

A revised, updated and integrated version of two review articles published in the Institute's journal, International Materials Reviews which dealt with the processing and the thermomechanical response of functionally graded materials. It includes new developments which have occurred since these articles were written.

Functionally Graded Materials CRC Press

The book is a collection of best selected research papers presented at the 5th International Conference on Inventive Material Science Applications (ICIMA 2022) organized by PPG Institute of Technology, Coimbatore, India, during May 6–7, 2022. The book includes original research by material science researchers toward developing a compact and efficient functional elements and structures for micro-, nano-, and optoelectronic applications. The book covers important topics like nanomaterials and devices, optoelectronics, sustainable electronic materials, nanocomposites and nanostructures, hybrid electronic materials, medical electronics, computational material science, wearable electronic devices and models, and optical/nanosensors.

Proceedings of Fifth International Conference on Inventive Material Science Applications CRC Press

The HIP process was originally devised for diffusion bonding of nuclear fuel elements at Battelle Memorial Institute in the United States in the mid-1950s. This innovative technique has been a subject of global research and development, and was applied to the cemented carbide industry at the end of the 1960s by ASEAj Sandvik. Since then this process has been applied to many kinds of industrial materials, including tool steel, superalloys and electronic and ceramic materials. In very recent years, HIPing technology has been applied even to R& D of high temperature superconducting materials and of a composite process with self

combustion reaction. On this occasion we should recognize that the 3rd HIP Conference was held in the midst of such progress of HIP technology, and that it was the first international conference which was held in Asia in the field of HIP and CIP technologies. The conference was very successful, with about 250 participants from 13 countries, including Japan. About 90 presentations, including nine invited lecturers, 44 oral and 35 poster presentations, were offered, and all contributions were at a high level and contained valuable results which had been attained in recent years.

Loadings in Thermal Barrier Coatings of Jet Engine Turbine Blades

Springer Nature

This book discusses complex loadings of turbine blades and protective layer Thermal Barrier Coating (TBC), under real working airplane jet conditions. They obey both multi-axial mechanical loading and sudden temperature variation during starting and landing of the airplanes. In particular, two types of blades are analyzed: stationary and rotating, which are widely applied in turbine engines produced by airplane factories.

Introduction to Finite Element Analysis Using MATLAB® and Abaqus

Amer Ceramic Society

This book (Vol. II) presents select proceedings of the first Online International Conference on Recent Advances in Computational and Experimental Mechanics (ICRACEM 2020) and focuses on theoretical, computational and experimental aspects of solid and fluid mechanics. Various topics covered are computational modelling of extreme events; mechanical modelling of robots; mechanics and design of cellular materials; mechanics of soft materials; mechanics of thin-film and multi-layer structures; meshfree and particle based formulations in continuum mechanics; multi-scale computations in solid mechanics, and materials; multiscale mechanics of brittle and ductile materials; topology and shape optimization techniques; acoustics including aero-acoustics and wave propagation; aerodynamics; dynamics and control in micro/nano engineering; dynamic instability and buckling; flow-induced noise and vibration; inverse problems in mechanics and system identification; measurement and analysis techniques in nonlinear dynamic systems; multibody dynamical systems and applications; nonlinear dynamics and control; stochastic mechanics; structural dynamics and earthquake engineering; structural health monitoring and damage assessment; turbomachinery noise; vibrations of continuous systems, characterization of advanced materials; damage identification and non-destructive evaluation; experimental fire mechanics and damage; experimental fluid mechanics; experimental solid mechanics; measurement in extreme environments; modal testing and dynamics; experimental hydraulics; mechanism of scour under steady and unsteady flows; vibration measurement and control; bio-inspired materials; constitutive modelling of materials; fracture mechanics; mechanics of adhesion, tribology and wear; mechanics of composite materials; mechanics of multifunctional materials; multiscale modelling of materials; phase transformations in materials; plasticity and creep in materials; fluid mechanics, computational fluid dynamics; fluid-structure interaction; free surface, moving boundary and pipe flow; hydrodynamics; multiphase flows; propulsion;

internal flow physics; turbulence modelling; wave mechanics; flow through porous media; shock-boundary layer interactions; sediment transport; wave-structure interaction; reduced-order models; turbo-machinery; experimental hydraulics; mechanism of scour under steady and unsteady flows; applications of machine learning and artificial intelligence in mechanics; transport phenomena and soft computing tools in fluid mechanics. The contents of these two volumes (Volumes I and II) discusses various attributes of modern-age mechanics in various disciplines, such as aerospace, civil, mechanical, ocean engineering and naval architecture. The book will be a valuable reference for beginners, researchers, and professionals interested in solid and fluid mechanics and allied fields.