

**Proceedings of the
Ninth International Conference on
Computational Structures Technology**

Civil-Comp Press publications on Computational Engineering

Proceedings of the Eleventh International Conference on Civil, Structural and Environmental Engineering Computing

Edited by: B.H.V. Topping

Proceedings of the Ninth International Conference on the Application of Artificial Intelligence to Civil, Structural and Environmental Engineering

Edited by: B.H.V. Topping

Proceedings of the Fifteenth UK Conference of the Association of Computational Mechanics in Engineering

Edited by: B.H.V. Topping

Proceedings of the Eighth International Conference on Computational Structures Technology

Edited by: B.H.V. Topping, G. Montero & R. Montenegro

Proceedings of the Fifth International Conference on Engineering Computational Technology

Edited by: B.H.V. Topping, G. Montero & R. Montenegro

Saxe-Coburg Publications on Computational Engineering

Computational Methods for Acoustics Problems

Edited by: F. Magoulès

Mesh Partitioning Techniques and Domain Decomposition Methods

Edited by: F. Magoulès

Object Oriented Methods and Finite Element Analysis

R.I. Mackie

Programming Distributed Finite Element Analysis

R.I. Mackie

Computer Aided Design of Cable-Membrane Structures

B.H.V. Topping and P. Iványi

Domain Decomposition Methods for Distributed Computing

J. Kruis

Computational Modelling of Masonry, Brickwork and Blockwork Structures

Edited by: J.W. Bull

Finite Element Mesh Generation

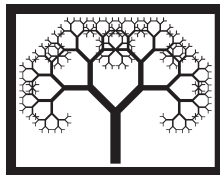
B.H.V. Topping, J. Muylle, P. Iványi, R. Putanowicz and B. Cheng

Civil Engineering Computations: Tools and Techniques

Edited by: B.H.V. Topping

**Proceedings of the
Ninth International Conference on
Computational Structures Technology**

Edited by
B.H.V. Topping and M. Papadrakakis



CIVIL-COMP PRESS

© Civil-Comp Ltd, Stirlingshire, Scotland

published 2008 by
Civil-Comp Press
Dun Eaglais, Kippen
Stirlingshire, FK8 3DY, UK

Civil-Comp Press is an imprint of Civil-Comp Ltd

ISBN 978-1-905088-21-8 (Book)
ISBN 978-1-905088-22-5 (CD-Rom)
ISBN 978-1-905088-23-2 (Combined Set)

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Cover Image: mesh created by R. Montenegro and G. Montero based on the “25 Years of Civil-Comp Conferences” logo.

Printed in Great Britain by Bell & Bain Ltd, Glasgow

Contents

Preface

Modeling and Simulation of Composite and Adaptive Structures

Session organised by C.M. Mota Soares

- 1 The Finite Spectral method for Composite Structures
A.Y.T. Leung
- 2 Development of Latticed Towers Using Advanced Composite Materials
A. Ochonski, D.J. Polyzois and I.G. Raftoyiannis
- 3 Simulation of Fluid-Structure Interaction Phenomena of a Composite Rocket Nozzle
J.F.P. Pitot de la Beaujardiere, E.V. Morozov and G. Bright
- 4 Damping Optimisation of Sandwich Composite Structures
A.L. Araújo, P. Martins, C.M. Mota Soares and C.A. Mota Soares
- 5 A Layerwise Mixed Least-Squares Finite Element Model for Static Analysis of Multilayered Composite Plates
F. Moleiro, C.M. Mota Soares, C.A. Mota Soares and J.N. Reddy
- 6 Optimisation of Composite Adaptive Response with Experimental Validation
N.L. Mulcahy, G. Prusty and C.P. Gardiner
- 7 Buckling of Ageing Elastic and Viscoelastic Beam-Columns of Composite Material
B.F. Oliveira and G.J. Creus
- 8 Adaptive Methods for Analysis of Composite Beams and Plates with Radial Basis Functions
A.M.A. Neves, A.R.H. Heryudono, T.A. Driscoll, A.J.M. Ferreira and C.M.M. Soares
- 9 Analysis of Laminated Plates with Third Order Plate Theory and with the Natural Neighbour Radial Point Interpolation Method
L.M.J.S. Dinis, R.M. Natal Jorge and J. Belinha
- 10 Effect of the Failure Criterion on the Minimum Weight of Laminated Composites
R.H. Lopez, M.A. Luersen and E.S. Cursi
- 11 Active-Passive Damping Treatment for Elastoacoustic Problems
J.F. Deü, W. Larbi and R. Ohayon
- 12 Environmental Effects on the Mechanical Properties of a Graphite Plate as Related to Applications in a Fuel Cell
B. Kim, Y.H. Lee, Y.M. Kim, H.S. Lee, S.M. Yang and S.H. Ahn

- 13 Evaluation of the Buckling Critical Load of Bars Subjected to their Self-Weight
A.M. Wahrhaftig, R.M.L.R.F. Brasil and M.A.S. Machado
- 14 Cost-Weight Trades for Stiffened Composite Panels Under Compression
P. Apostolopoulos and C. Kassapoglou
- 15 An Improved Numerical-Experimental Method for Damage Location in Structures
H.M.R. Lopes, J.V. Araújo dos Santos, C.M. Mota Soares, R.M. Guedes, M.A. Vaz

Multi-Scale Numerical Modeling of Engineering Structures

Session organised by J.Q. Ye and Y. Sheng

- 16 Three-Dimensional Coupled Discrete Element - Finite Element Model: Parameter Identification and Coupling with Shells
J. Rousseau, E. Frangin, P. Marin, L. Daudeville and S. Potapov
- 17 Distinct Element Modelling of Masonry Wall Panels with Openings
V. Sarhosis, S.W. Garrity and Y. Sheng
- 18 A Numerical Study of the Elastic Behaviors of Carbon-Epoxy Lamina under Uni-Axial Compression Using the Discrete Element Method
D.M. Yang, Y.Q. Tan, J.Q. Ye and Y. Sheng

Numerical Design of Protective Structures

Session organised by N. Gebbeken

- 19 Architectural Concepts to Reduce the Effects of Explosions
N. Gebbeken and T. Döge
- 20 Ballistic Resistance of Double-Layered Metal Plates
T. Børvik, S. Dey, O.S. Hopperstad, T. Wierzbicki and X. Teng
- 21 Numerical Safety Assessment of a Transport and Storage Cask for Radioactive Materials without Impact Limiters by the 0.3m Drop Test onto an Unyielding Target
L. Qiao, U. Zencker, G. Wieser and H. Völzke
- 22 Simulation of the Crushing of Wood Filled Impact Limiters for Packages of Radioactive Material
M. Neumann and F. Wille

Modelling of Composite Beams

Session organised by J. Murin

- 23 A Geometric Nonlinear Sandwich Composite Bar Finite Element with Transversal and Longitudinal Variation of Material Properties
R. Ďuriš and V. Goga
- 24 An Effective Multiphysical Functionally Graded Material Beam-Link Finite Element with Transversal Symmetric and Longitudinal Continuous Variation of Material Properties
J. Murín, V. Kutiš and M. Masný
- 25 Stability of a Composite Beam-Column with Transversal and Longitudinal Variation of Material Properties
V. Kutiš and J. Murín
- 26 Analytical Calculation of Composite Beams According to Second Order Theory
M. Aminbaghai and R. Binder

- 27 The Shear Deformation Effect in the Flexural-Torsional Vibration of Composite Beams Using the Boundary Element Method
E.J. Sapountzakis and J.A. Dourakopoulos

Mechanics of Composites, Functionally Graded and Piezoelectric Materials

Session organised by T. Kant

- 28 Axisymmetric Bending of Thick Functionally Graded Circular Plates Using Fourth-Order Shear Deformation Theory
S. Sahraee and A.R. Saidi
- 29 On Non-Linear Vibration of Laminated Composite Piezoelectric Plates
M. Tanveer and A.V. Singh
- 30 A Shear-Deformation Theory for Composite and Sandwich Plates Using Improved Zigzag Kinematics
A. Tessler, M. Di Sciuva and M. Gherlone
- 31 Electromechanical Response of Piezoelectric, Functionally Graded and Layered Composite Cylinders
T. Kant and P. Desai
- 32 Thermal Buckling Analysis of Thick Functionally Graded Circular Plates Using Unconstrained Third-Order Shear Deformation Plate Theory
A.R. Saidi and S. Sahraee
- 33 Material Forces for Simulation of Brittle Crack Propagation in Functionally Graded Materials
R. Mahnken
- 34 Finite Element Analysis of Crack Initiation in PZT Transducers
J. Novak
- 35 Modeling with Uncertainty and Robust Control of Smart Beams
A. Moutsopoulou, A. Pouliezos and G.E. Stavroulakis
- 36 Mesh Generation for Cavity Damage Identification in Piezoelectrics
R. Palma, G. Rus, J.L. Pérez-Aparicio and R. Gallego

Spectral and Wave Element Methods for Structural Response Prediction and Damage Detection

Session organised by J.R. Arruda

- 37 Models of Space Energetics of Coupled Plates for High Frequency Vibrations
V.S. Pereira and J.M.C. Dos Santos
- 38 Vibration and Wave Propagation Approaches Applied to Assess Damage Influence on the Behavior of Euler-Bernoulli Beams: Part I Direct Problem
K.M. Fernandes, L.T. Stutz, R.A. Tenenbaum and A.J. Silva Neto
- 39 Vibration and Wave Propagation Approaches Applied to Assess Damage Influence on the Behavior of Euler-Bernoulli Beams: Part II Inverse Problem
K.M. Fernandes, L.T. Stutz, R.A. Tenenbaum and A.J. Silva Neto
- 40 Modelling Wave Propagation in Laminated Composite Structures
G. Inqui  t  , P. Saad, B. Petitjean, B. Troclet, M.N. Ichchou and L. Jezequel
- 41 Building Spectral Elements from Finite Element Models of Waveguide Slices
J.R.F. Arruda and R.F. Nascimento

- 42 Dynamic Stiffness Matrix of an Axisymmetric Shell and Distributed Loads
M.A. Khadimallah, J.B. Casimir, M. Chafra and H. Smaoui
- 43 Spectral Element Modeling for the Dynamics of Flexible Rotor Systems
J. Lee and U. Lee
- 44 Wave Finite Element Method for Modelling of Constrained Layer Damping Treatment in Laminated Plates
E. Manconi and B.R. Mace
- 45 A Wave Based Prediction Technique for the Dynamic Response Analysis of Plates with Random Point Mass Distributions
K. Vergote, B. Van Genechten, B. Pluymers, D. Vandepitte and W. Desmet
- 46 On the Forced Response of Multi-Layered Systems Using the Modified Wave Finite Element Method
J.-M. Mencik

Evolutionary and Non-Deterministic Methods in Structural Optimization

Session organised by M. Domaszewski

- 47 Evolutionary Computation Based Optimum Design for Non-Linear Elastic Steel Frames
G. Sánchez and P. Martí
- 48 Optimum Design of Unbraced Steel Frames to the LRFD-AISC Code Using Particle Swarm Optimization
E. Doğan and M.P. Saka
- 49 An Evolutionary Approach for the Topology Synthesis of Compliant Mechanisms
E. Veguería, O. Oyarzabal, R. Ansola, J. Santamaría, A. Maturana, E. García and J. Canales
- 50 A Harmony Search Algorithm for Optimum Topology Design of Single Layer Lamella Domes
S. Carbas and M.P. Saka
- 51 Optimization of Truss and Grillage Structures by a Non-Deterministic Method
D. Chamoret, K. Qiu, N. Labeled and M. Domaszewski

Stochastic Optimization Methods in Structural Analysis and Optimal Design

Session organised by K. Marti and G.I. Schuëller

- 52 Approximative Solutions of Stochastic Control Problems by Means of Convex Approximation
K. Marti
- 53 Optimal Design of Trusses Considering Uncertainty: A Comparison of Two Approaches
S. Zier
- 54 Fuzzy Probabilistic Models in Structural Reliability
A. Omishore, Z. Kala and L. Puklický
- 55 Sensitivity Analysis of Computer Models of Structures with Green's Functions
F. Hartmann and T. Kunow
- 56 Optimal Control of Robots in the Case of Random Initial Conditions
M. Schacher
- 57 Efficient Strategies for Solving Reliability-Based Optimization Problems
M.A. Valdebenito and G.I. Schuëller

Soft Computing and Structural Engineering

Session organised by Y. Tsompanakis and N. Lagaros

- 58 Seismic Safety Assessment of the Tower of the S. Maria Maggiore Cathedral in Guardiagrele, Italy
G. Camata, L. Cifelli, E. Spacone, J. Conte, M. Loi and P. Torrese
- 59 Assessment of Design Recommendations for Torsionally Unbalanced Structures Using Structural Optimization
N. Bakas, N.D. Lagaros and M. Papadrakakis
- 60 Optimum Design of Arch Dams Including Hydrodynamic Effects for Earthquake Loading Using the Simultaneous Perturbation Stochastic Approximation Method
J. Salajegheh, E. Salajegheh, S.M. Seyedpoor and S. Gholizadeh
- 61 Multi-Objective Seismic Design of Reinforced Concrete Buildings
St. Tsivouraki, N.D. Lagaros and M. Papadrakakis
- 62 Artificial Intelligence Techniques in the Simulation of Viscoplasticity of Polymeric Composites
M.S. Al-Haik, M.Y. Hussaini and C.S. Rogan

Differential Quadrature, Generalized Methods and Related Discrete Element Analysis Methods

Session organised by C.N. Chen

- 63 Plastic Collapse Analysis of Arch Structures by Using the Differential Quadrature Element Method with a Global Secant Relaxation-Based Accelerated Iteration Procedure
C.N. Chen
- 64 Timoshenko Beam Structures Resting on a Two-Parameter Elastic Foundation Solved by the Differential Quadrature Element Method
C.N. Chen
- 65 Time Domain Analysis of Dam Reservoir Foundation Interaction Using the Differential Quadrature and Finite Difference Methods
M.R. Koohkan, R. Attarnejad and S. Aliamiri

Application of Finite Element Methods for the Analysis and Design of Steel and Concrete Structures

Session organised by E.S. Mistakidis

- 66 Numerical Simulation of Bending Response of Reinforced Concrete and Fibre-Reinforced Concrete Beams
K.A. Georgiadi-Stefanidi, E.S. Mistakidis and P.C. Perdikaris
- 67 Flange and Web-Triggered Local-Distortional Mode Interaction in Cold-Formed Steel Lipped Channel Beams: Finite Element Analysis
P.B. Dinis and D. Camotim
- 68 A Rotating Magnetic Field for Detection of Cracks in Metal Welded Joints and Quality Control
M. Buonsanti, M. Cacciola, G. Megali, F.C. Morabito, D. Pellicanò and M. Versaci
- 69 Buckling Behaviour of Thin-Walled Cold Formed Steel Platforms Subjected to Bending
K.A. Tzaros and E.S. Mistakidis
- 70 A Crack Model with Delayed Embedded Discontinuities for the Numerical Prediction of Crack Widths in Concrete Structures
Y. Theiner and G. Hofstetter

- 71 The Application of an Exact Finite Strip for Calculation of Initial Post-buckling Stiffness of Channel Section Struts
H.R. Ovesy and S.A.M. Ghannadpour

Structural Analysis and Optimization in Acoustics and Vibrations

Session organised by M. Matos Neves and J.F. Aguilar Madeira

- 72 Time-Space Topology Optimization
J.S. Jensen
- 73 Plate Eigenfrequency Optimization with Genetic Algorithms and Random Keys
J.F. Aguilar Madeira, H.L. Pina and H.C. Rodrigues
- 74 Attenuation of the Flow Induced Vibration of a Plate by Topology Optimization of the Properties of the Supports
F.J.P. Lau and A.A. Gomes
- 75 Transient Topology Optimization of Two-Dimensional Elastic Wave Propagation
R. Matzen, J.S. Jensen and O. Sigmund
- 76 Detection of an Inclusion in a Membrane Using a Genetic Algorithm
D. Rabinovich, D. Givoli and S. Vigdergauz
- 77 Design of New Materials for Passive Vibration Control
T. Lopes, Z. Dimitrovová, L. Faria and H.C. Rodrigues
- 78 Optimization of H_∞ Controller with Preview for Semi-active Magnetorheological Suspension Systems
R.S. Prabakar, S. Narayanan and C. Sujatha
- 79 On the Optimal Block Length of a Frequency Domain Adaptive Algorithm for an Active Noise Control System Using a Simultaneous Equations Method
K. Fujii, Y. Iwamatsu, T. Ujino and M. Muneyasu
- 80 Optimal Acoustic Design of Floors Subjected to Impact Forces
A. Neves e Sousa
- 81 Simulation of Sound Propagation between Two Closed Spaces Using the Method of Fundamental Solutions
L.M.C. Godinho, F.G. Branco and P. Amado Mendes
- 82 An Adaptive Method for State Estimation of a Sound Environment System with Unknown Structure and Fuzzy Observation
H. Masuike and A. Ikuta
- 83 Sound Power Radiated from Rectangular Plates with Unconstrained Damping Layers
J.P. Arenas and K.H. Hornig
- 84 Modelling Wave Propagation Problems in Acoustics and Vibrations Using the Boundary Element Method
P. Santos
- 85 Modeling of the Human Cochlea using the Finite Element Method
T. Koike, T. Yamamoto, S. Murakami and K. Homma
- 86 A Robust Component Mode Synthesis Method for Stochastic Vibroacoustic Problem
Q.H. Tran, M. Ouisse and N. Bouhaddi

- 87 Modeling a Class of Mechanical Complementary-Slackness Systems
Q. Feng and R.Y. Shen
- 88 A Cancellation Method of Background Noise for a Sound Environment System with Unknown Structural Characteristics
A. Ikuta and H. Masuike
- 89 Comparison Between Local Wall Impedance and More Refined Poroelastic Models in Vibroacoustics
W. Larbi, J.F. Deü and R. Ohayon
- 90 Finite Element Analysis of Surface Acoustic Waves in High Aspect Ratio Electrodes
M.B. Dühring, V. Laude and A. Khelif
- 91 Ultrasound Propagation in Asphalt
I. Chilibon and S. Velizar
- 92 Multiscale Characterisation of Urban Acoustic Diffusion Processes
P. Woloszyn
- 93 Micro-polar Continuum Modelling of a Lattice Structure: Theory and Experiment
A. Salehian and D.J. Inman
- 94 Free Vibration Analysis of Open Conical and Spherical Shells Supported on Parts of the Edges
S. Kandasamy and A.V. Singh
- 95 On Computational Issues for Free Vibration Response Using the Constant Hysteretic Damping Model
M.M. Neves and N. Maia
- 96 The Timoshenko Beam: State-of-the-Art
M.P. Coleman
- 97 Vibration Amplitude Maps Obtained by Non-Contact Measurement Techniques: A Survey
D.N. Borza and I. Nistea
- 98 A Design Method for a Cluster Control System Using a Cluster Vector Strategy
N. Tanaka
- 99 Analysis and Optimization of Acoustic Transmission Loss of Double Glazing Windows on a Maglev Transrapid Vehicle
W.K. Jiang, Q.G. Liu and Q. Wan
- 100 Modal Identification and Vibration Analyses for Noise Reduction in the CUORE Cryogenic Experiment
R. Ardito, C. Brofferio, C. Gargiulo and S. Morganti
- 101 Monitoring Pumping Systems Using Vibration Signal Analysis
S. Al-hashmi
- 102 Dynamic Properties of a Tooling Structure: Hydraulic Clamping versus Standard Screw Clamping in a Lathe Application
H. Åkesson, T. Smirnova, L. Håkansson, I. Claesson and T. Lagö
- 103 The Wake Influence on the Vibration Behaviour of a Ship Structure
L. Moraru, I. Bosoanca and R. Pirvulescu
- 104 Thermal Vibrational Convection and Applications
V.A. Demin, I.A. Babushkin and A.F. Glukhov

Probabilistic Approaches and Optimisation for Structural Mechanics

Session organised by A. Elhami and M. Karama

- 105 Topology Optimization Based on the Level-Set Method for Passive Damping of Structures
S. Bouzidi, M.L. Bouazizi, M. Guedri and N. Bouhaddi
- 106 Towards Efficient Reliability Methods with Applications to Industrial Problems
I. Papaioannou, H. Heidkamp, A. Düster, E. Rank and C. Katz
- 107 Reliability Based Design Optimisation of Laminated Composite Plates
R.H. Lopez, J.E. Rojas, E.S. Cursi and A. El-Hami
- 108 A Hybrid Method for Reliability and Redundancy Allocation in a Complex System
W. Elalem, A. El Hami, R. Ellaia and M. Souissi
- 109 Probabilistic Analysis of Buckling Loads of Bridges
K. Ikeda
- 110 Structural Optimization Using a Stochastic Method
W. Elalem, A. El Hami and R. Ellaia
- 111 Acceleration-Based Optimum Design of Offshore Platforms Subjected to Ice Loading
G. Li, X. Liu and G.D. Cheng
- 112 Convergence Control of Structural Optimization and Reliability Analysis Algorithms Based on Chaos Theory
D.X. Yang and G.D. Cheng

Damage Identification

Session organised by C.A. Papadopoulos

- 113 A Coherence Analysis Based Approach for Locating Nonlinear Components in Multi-Degree of Freedom Systems
Z.Q. Lang and Z.K. Peng
- 114 Damage Identification Using Uniform Random Load Surface Spectral Strain Energy
W.L. Bayissa and N. Haritos
- 115 Damping Associated with Porosity in Porous Rectangular Plates
K.M. Stamatopoulos, I.T. Chondrou and S.D. Panteliou
- 116 Inverse Problem Sensitivity to System Uncertainties for Damage Detection in Piezoelectrics
G. Rus, R. Palma, R. Gallego and J.L. Pérez-Aparicio
- 117 Damage Analysis of Metallic Open-Lattice Cellular Cores Under Static and Dynamic Loading
G.N. Labeas, M.M. Sunaric and V.P. Ptochos
- 118 Fault Diagnosis of Journal Bearings Based on Artificial Neural Networks and Measurements of Bearing Performance Characteristics
K.M. Saridakis, P.G. Nikolakopoulos, C.A. Papadopoulos and A.J. Dentsoras
- 119 Applying External Excitation to a Rotor for Wear Identification of the Non-Linear Fluid-Film Bearings
P.G. Nikolakopoulos, A.C. Chasalevris and C.A. Papadopoulos
- 120 Wear Identification in Rotor-Bearing Systems by Volumetric and Bearing Performance Characteristics Measurements
K.P. Gertzos, P.G. Nikolakopoulos, A.C. Chasalevris and C.A. Papadopoulos

- 121 Cracked and Unbalanced Rotating Shaft Behaviour During Start Up: Analyzing the Response by Conventional Fourier Transform and Wavelets
J.C. Gómez-Mancilla and J.A. Meda-Campaña
- 122 Crack Identification Using External Excitation and Coupled Response of a Continuously Modeled Rotor with Internal Damping, Mounted on Nonlinear Fluid Film Bearings
A.C. Chasalevris and C.A. Papadopoulos
- 123 Non-Linear Vibration Technique for Crack Detection in Beam Structures Using Frequency Mixing
K. Zacharias, E. Douka, L.J. Hadjileontiadis and A. Trochidis
- 124 Crack Identification in Vibrating Beams and Fracture Mechanics Applications
T.G. Chondros

Computational Tools for Earthquake and Structural Dynamics

Session organised by S.H. Lo

- 125 Open Issues in Retaining Wall-Soil-Structure Dynamic Interaction
G. Papazafeiropoulos, Y. Tsompanakis and P.N. Psarropoulos
- 126 GENQKE: A Computer Program for Generating Artificial Earthquake Accelerograms and Elastic Response Spectra
H.H. Tsang and N.T.K. Lam
- 127 Computational Tools for Analysis of Responses to Transient Loading
N.T.K. Lam and H.H. Tsang
- 128 Finite Element Modelling of a New Earthquake Protection Method Involving Soil-Structure Interaction
S.H. Lo, X. Xu, H.H. Tsang and M.N. Sheikh
- 129 Yield Curvature for the Design of Normal- and High- Strength Circular Reinforced Concrete Columns
M.N. Sheikh, H.H. Tsang and T.J. McCarthy
- 130 Implementation of a Low-Cost Structural Dynamics Investigative System
N. Haritos

Non-Linear Dynamics

Session organised by M. Amabili

- 131 Nonlinear Vibrations of Plates with Fluid-Structure Interaction
M. Amabili and S. Carra
- 132 The Dynamic Analysis of Beams Subjected to Large Amplitude Transverse Vibrations
F.Q. Melo, R. Valente and R.C. Barros
- 133 Nonlinear Stability of Shells Conveying Fluid Flow
M. Amabili, K. Karagiozis and M.P. Païdoussis

Finite Element Methods

- 134 A New Triangular Flat Shell Element with Drilling Rotations
L. Damkilde
- 135 The Wavelet-Based Theory of Spatial Naturally Curved and Twisted Linear Beams
E. Zupan, D. Zupan and M. Saje

Finite Elements: Plasticity

- 136 Strict Bounds for Quantities of Interest for Plasticity Problems
M. Wynant, P. Ladevèze and E. Florentin

Finite Elements: Modelling and Design

- 137 A Study of the Dynamic Behaviour of a Typical Indian Railway Track System
K. Ganesh Babu and C. Sujatha
- 138 Strength Shaping of Dished Heads of Pressure Cylindrical Vessels
L. Wittenbeck and K. Magnucki
- 139 Inelastic Buckling of Geometrically Imperfect Tubes under External Hydrostatic Pressure
A.P.F. Little, C.T.F. Ross, D. Short and G.X. Brown
- 140 Numerical and Experimental Study into Behaviour of Cylinders Under Edge Shear Force and External Pressure
J. Błachut and O.R. Jaiswal
- 141 Plastic General Instability of Ring-Stiffened Conical Shells under External Pressure
C.T.F. Ross, A.P.F. Little and G. Andriopoulos
- 142 Structural Behaviour of Expanded Metal Sheets
G. Martínez, C. Graciano, E. Casanova and O. Pelliccioni
- 143 Collapse of Carbon-Glass Composite Tubes under Uniform External Pressure
C.T.F. Ross, A.P.F. Little, Y. Haidar and A. Al Waheeb

Boundary Element Methods

- 144 Prediction of Low Frequency Sound Transmission by a Vibrating Single Structure
P. Santos and D. Mateus
- 145 Nonlinear Elastic Nonuniform Torsion of Bars of Arbitrary Cross Section Using the Boundary Element Method
E.J. Sapountzakis and V.J. Tsipiras
- 146 Elastoplastic Boundary Element Method Formulation for Plates with Geometrical Non-Linearity
L. Waidemam, W.S. Venturini and H.B. Coda
- 147 A Boundary Element - Differential Equation Method Coupling for Plate-Beam Interaction
J.B. Paiva and A.V. Mendonça

Plate Problems

- 148 Elasto-Plastic Post-Buckling Strength of Uniformly Compressed Plates
M. Rosmanit
- 149 A Refined Five-Node Transition Plate Bending Element Based on Kirchhoff Plate Theory
H. Gedikli and H. Sofuoğlu
- 150 On the Spurious Mechanisms of an Eight-Node Mindlin Plate Finite Element Model
J.E. Abdalla Filho, I.M. Belo and R.D. Machado

Damage and Identification Problems

- 151 An Approach to Automated Modal Parameter Identification for Structural Health Monitoring Applications
C. Rainieri, G. Fabbrocino and E. Cosenza
- 152 Finite Element Analysis of Periodic Structures and their Application for Structural Health Monitoring
W.J. Zhou and M.N. Ichchou
- 153 Anisotropic and Unilateral Damage: Application to Concrete
O. Bélaïdi Chabane Chaouche, Y. Labadi and N.E. Hannachi
- 154 Inference Models for Structural Systems Integrity Monitoring: Neural Networks and Bayesian Enhancements
S. Arangio
- 155 A Method for the Deterministic and Stochastic Time Domain Identification of Structures
P. Cacciola, N. Maugeri and G. Muscolino
- 156 Modal Material Identification Method Using a Dissipative Finite Element Model
M. Matter, Th. Gmür, J. Cugnoni and A. Schorderet
- 157 An Anisotropic Damage Model for Concrete in Coupled Problems
T. Koudelka and T. Krejčí
- 158 Structural Analysis of Corroded Pipelines Containing Complex Defects
R.D. Machado, J.E. Abdalla F. and H.Y. Shang

Shakedown Analysis and Design

- 159 Optimal Shakedown Design of Frames Under Stability Conditions
J. Atkočiūnas and A. Venskus
- 160 A Static Shakedown Theorem for Materials with Temperature-Dependent Elastic Modulus
A. Oueslati and G. de Saxcé
- 161 Reliability Based Limit Analysis and Shakedown of Framed Structures with Limited Residual Strain Energy Capacity
J. Lógó, M. Movahedi Rad, J. Knabel and Z. Hortobágyi

Analysis of Trusses, Frames and Space Structures

- 162 Displacement and Force Control in Pin-Jointed Assemblies
A.S.K. Kwan
- 163 Planar Truss Structures with Multi-Symmetry
A. Kaveh and L. Shahryari
- 164 A New Approach for the Analysis of Bending Elements with Variable Thickness
R. Attarnejad and S. Aliamiri
- 165 Coupling Dynamic Buckling Analysis of Framed Structures Using a Spline Finite Element
H. Yang and A.Y.T. Leung
- 166 Interrelation of Group Products and Graph Products in Configuration Processing of Symmetric Structures
A. Kaveh and M. Nikbakht
- 167 The Nonlinear Analysis of Frames with Semi-Rigid Connections and Shear Deformations
H. Görgün and S. Yılmaz

- 168 An Enhanced Positional Finite Element Formulation for Geometrical Non-Linear Analysis of Three-Dimensional Laminate Frames
H.B. Coda
- 169 Estimation of Critical Flutter Load of a Cracked Shaft Simultaneously Subjected to a Follower Force with an Axial Force
I. Takahashi

Structural Optimization

- 170 Response Surface Based Structural Optimization with Single-Cut Strategy for Fuzzy Limit Problems
C.J. Shih and H.W. Lee
- 171 Optimisation of the Computational Dimensioning Process with Consideration of Manufacturing Aspects
K. Thielemann

Shape and Topology Optimization

- 172 Shape and Size Optimisation of Concrete Shells Respecting the Original Design Form
A. Tomás and P. Martí
- 173 Numerical Design Optimisation for the Karoo Array Telescope
N.J.D. Joubert and G. Venter
- 174 Topology Optimization of Trusses Modeled Similar to Truss-like Structures
V. Pomezanski
- 175 Three-Dimensional Structural Shape Optimisation Incorporating Surface Point Mapping
G. Baylor and D. Kelliher
- 176 Topology Optimization Using the Optimality Criterion Method
M.A. Hendel and K.Z. Truman
- 177 Optimization of Contact Problems Using a Topology Derivative Method
A. Myśliński

Reliability Design

- 178 Road Tankers Load Distribution Design and Rollover Stability Simulation
A.S. Papadogiannis, P. Michaelides, G. Michalos and T.G. Chondros
- 179 Probabilistic Parametric Analysis of the Thermal Conducting LTCC Substrate for an LED Lamp
S.C. Lin, R.F. Huang, C.C. Lin and Y.T. Lin

Reliability Analysis and Modelling

- 180 Stochastic Finite Element Stability Analysis of Shells with Non-Gaussian Material and Thickness Properties
G. Stefanou, V. Papadopoulos and M. Papadrakakis
- 181 Solving the Dynamic Reliability Equations of the Theory of Stimulated Dynamics
I. Cañamón and J.M. Izquierdo
- 182 A Time-Variant Reliability Approach for Ageing Marine Structures with Non-Linear Behaviour
J.Y. Cognard, M. Mejri and M. Cazuguel

Probabilistic Engineering Problems

- 183 Numerical Structural Monitoring for Textile Strengthened Reinforced Concrete Structures
F. Steinigen, W. Graf, M. Kaliske and J.-U. Sickert

Dynamics and Vibration

- 184 Computational Modelling of the Static and Dynamic Behaviour of Wind Turbine Tower Structures
A. da S. Sirqueira, P.C.G. da S. Vellasco, J.G.S. da Silva, L.R.O. de Lima and S.A.L. de Andrade
- 185 Model Reduction in Finite Element Analysis for a Fluid Filled Pipe Using an Orthogonal Vector Set
R.J. Alkhoury, M.H. Chikhalsouk, R.B. Bhat and K.D.P. Nigam
- 186 Dynamic Analysis of the High Speed Steel Bars Cutting Structure
J. Benčat and D. Papán
- 187 Estimation of the Dynamic Validity Range of Linearised Structural Mechanical Models
M. Lazanowski, H. Kärcher, H. Li, S. Kern and M. Schäfer
- 188 Validation of Simulation Approaches for Catenary-Pantograph Dynamics
J.R. Jimenez-Octavio, M. Such, A. Carnicero and O. Lopez-Garcia
- 189 Estimation of an Active Boring Bar's Control Path Frequency Response Functions by Means of its Three-Dimensional Model with Coulomb Friction
T. Smirnova, H. Åkesson, L. Håkansson, I. Claesson and T. Lagö
- 190 Analytical Solutions for Vibrating Fractal Rods
M.T. Alonso Rasgado and K. Davey
- 191 The Fractal Generalized Finite Difference Method in Elastodynamics
G.M. Cocchi and P. Tiriaca

Passive Damping Systems

- 192 Rheological-Dynamical Theory of Vibrations of Multi-Degree-of-Freedom Structures:
Design of Viscoelastoplastic Dampers
D.D. Milašinović and A. Borković
- 193 Optimization of the Location and Damping Constants of Viscous Dampers
R. Lewandowski
- 194 A New Bidirectional Rolling Tuned Mass Damper for the Wind Control of Tall Buildings
E. Matta

Seismic Engineering

- 195 Contribution to Reliability Assessment of Concrete Dams under Dynamic Effects
R.C. Silva and L.J. Pedroso
- 196 Seismic Analysis of Plane Frame Structures
D. Mestrovic and L. Miculinic
- 197 Automated Baseline Correction, Fling and Displacement Estimates from the Chi-Chi Earthquake using the Wavelet Transform
A.A. Chanerley and N. Alexander

- 198 Optimization of Masonry Infilled Reinforced Concrete Buildings
I.A. Naziris, N.D. Lagaros and M. Papadrakakis
- 199 Fragility Based Critical Assessment of Design Codes
Ch.Ch. Mitropoulou, N.D. Lagaros and M. Papadrakakis
- 200 Dynamic Analysis of Cylindrical Roof Shells for Earthquake Resistant Design
S. Ostovari Dailamani and J.G.A. Croll
- 201 Minimizing the Uncertainties of Seismological-Geotechnical Source Parameters using a Genetic Algorithm Approach
A. Nicknam, R. Abbasnia, M. Bozorgnasab, Y. Eslamian, A. Nicknam
- 202 High Performance Computing Applied to the Seismic Finite Element Analysis of an Historic Structure: The Temple of Athena in Paestum
G. Zaccone and L. Stando
- 203 Estimating the Seismological Source Parameters of the 2006 Silakhor Earthquake, Iran, Using a Genetic Algorithm
A. Nicknam, R. Abbasnia, Y. Eslamian, M. Bozorgnasab and A. Nicknam
- 204 Roof-Garden Tuned Mass Dampers for Seismic Mitigation: The Translational and the Pendulum Alternatives
E. Matta and A. De Stefano
- 205 The Dynamic Response of Seismic Intensity Indicators
C.S. Belsham

Wave Propagation Problems

- 206 A New Consistent Mass Matrix for Timoshenko's Flexural Model
J.E. Laier and C.C. Noronha
- 207 Dynamics of Shells Under Shock Loading: An Asymptotic Approach
L.Yu. Kossovich and I.V. Kirillova

Contact-Impact Problems

- 208 Simulation of a Foreign Object Damage Test on a Silicon Nitride Specimen
R. Dotoli, D. Lisi, D. Bardaro and O. Manni
- 209 Modelling of Glass Fibre Composites Subjected to Low Velocity Impact
J. Fan, Z.W. Guan and W.J. Cantwell
- 210 Equilibrium Configurations of Heavy Elastica Beams Under Unilateral Contact Constraints
M. Abdel-Jaber, S. Al-Sadder, A. Shatnawi and M. Mahdi
- 211 Simulation of Contact Among Rigid Surfaces by Using Short Range Force Fields
A. Contento, A. Di Egidio and A. Tatone

Steel Structures

- 212 Restraining Progressive Collapse of Pallet Rack Structures
A.L.Y. Ng, R.G. Beale and M.H.R. Godley
- 213 Performance Assessment of Steel Structures Subject to Fire Action
C. Crosti and F. Bontempi

- 214 On Welded Rail and Temperature Stressing for the Taiwan High Speed Railway
Y.C. Shiau, L.T. Lu, C.M. Huang and T.T. Yao
- 215 Effect of Support Stiffeners on Columns Strengthened by Plates in Rigid Connections
M. Foroughi and M.A. Barkhordari
- 216 A Finite Element Model for Three-Dimensional Steel Beam-to-Column Joints
A. Moreno, A. Loureiro, R. Gutiérrez and J.M. Reinosa
- 217 Stress State and Displacements of Cold Formed Thin Walled Channel Beams
P. Paczos, P. Zawodny and K. Magnucki
- 218 Sensitivity Analysis of Stability Problems with Steel Plane Frames
Z. Kala, A. Omishore and L. Puklický
- 219 Buckling Behaviour of Steel Columns Subjected to Fire
T. Hozjan, I. Planinc, M. Saje and S. Srpcič
- 220 Analytical Evaluation of Local Buckling Behaviour in Square Steel Tube Members
T. Ohtsuka and S. Motoyui

Reinforced Concrete Structures: Design

- 221 A Study on the Application of Expansion Anchor Reinforcement in Construction Engineering
Y.C. Shiau, C.S. Huang and P.L. Yen
- 222 Stress-Strain Material Diagrams for Profiled Steel Sheeting Reinforcement for In-Situ Cast Concrete Slabs
E. Chaparanganda
- 223 The Stress-Strain Material Deformation Model Based Calculation Method for Normal Composite Cross-Sections
E. Chaparanganda
- 224 A Hybrid Approach for the Non-Linear Analysis of Reinforced Concrete Cross Sections
T. Löhning, J. Schenk and U. Starossek
- 225 Two-Layer Pre-Stressed Beams Consisting of Normal and High Strength Steel Fibred Concrete
I. Iskhakov and Y. Ribakov

Reinforced Concrete: Analysis

- 226 Modelling of Concrete Fracture and Damage Due to High Temperatures
J. Červenka, L. Jendele and J. Surovec
- 227 The Influence of Elevated Temperatures on Tunnel Linings
P.P. Prochazka and S. Peskova
- 228 Non-Linear Bond Modelling for Reinforced Concrete
M.F.E. Eltayeb and C.T. Morley

Fibre Reinforced Concrete

- 229 Computational Verification of Experimental Research on Fibre Reinforced Concrete
J.R. Cigánek and A. Materna
- 230 Computational Research on Fibre Reinforced Concrete
J. Ciganek and A. Materna

Shell Structures

- 231 An Application of Probabilistic Methods for Estimation of Optimal Factors of Building Structures Found by Empirical Methods
M.A. Danieli (Danielashvili)
- 232 A Study of the Effect of Three-Dimensional Imperfections on the Nonlinear Behaviour of Hyperboloid Reinforced Concrete Cooling Towers
A. Mutoh
- 233 Buckling Analysis of Shells of Revolution Under Bending Loads
P. Jasion and K. Magnucki
- 234 Safety of Storm-Stressed Thin Reinforced Concrete Shells in Power Industries
W.B. Krätzig, M. Graffmann, R. Harte and U. Montag

Masonry Structures

- 235 Analysis of Homogenized Structural Models with Input Uncertainties
A. Materna, L. Kalocova, L. Lausova and J. Brozovsky
- 236 Seismic Behaviour of an Unreinforced Masonry Building with Various Floor Systems
M.E. Stavroulaki and Ch.K. Amanatidou
- 237 Static Analysis of Masonry Structures Based on Chen Criteria
J. Brožovský and O. Sucharda
- 238 Modelling the Seismic Behaviour of a Historical Masonry Building with Internal Wooden Structure
A.J. Morais and J.V. Lemos
- 239 Masonry Bridge Finite Element Modelling Based on Digital Photogrammetry and Ground Penetrating Radar Tests
I. Lubowiecka, J. Armesto, F.I. Rial and P. Arias
- 240 Stability of Double-Hinged Nonlinear Masonry Members under Combined Load
I. Mura

Crack Propagation: Modelling

- 241 Numerical Modelling of Crack Growth in Concrete Gravity Dams Based on the Discrete Crack Method
A.R. Lohrasbi and R. Attarnejad
- 242 An Efficient Computational Algorithm to Evaluate Fatigue Crack Growth under Variable Amplitude Loading from Strain-Life Data
J.T.P. Castro, M.A. Meggiolaro and A.C.O. Miranda
- 243 Practical Aspects Concerning the Numerical Implementation of the Fatigue Growth of Curved Cracks
M.A. Meggiolaro, A.C.O. Miranda, L.F. Martha and J.T.P. Castro
- 244 A Novel Implementation Strategy for Cohesive Crack Propagation
G. Geißler and M. Kaliske
- 245 A Heterogeneous Cohesive Crack Model for Quasi-brittle Materials Considering Spatially Varying Random Fracture Properties
Z.J. Yang and X.F. Xu

Timber Structures

- 246 Lateral Buckling of Timber Arches
U. Rodman, I. Planinc, M. Saje and D. Zupan
- 247 Collapse Analysis of Timber Structures
P.H. Kirkegaard and J.D. Sørensen
- 248 Sensitivity Analysis of the Behaviour of Wood Joints Made with Double-Sided Punched Metal Plate Fasteners
T. Zhu and Z.W. Guan
- 249 Seismic Behaviour of Lightweight Structures
D. Mestrovic, V. Rajcic, D. Cizmar, M. Stepinac and L. Miculinic

Microstructures: Analysis and Modelling

- 250 Simulation of Fragile Structures Using the Mechanics of Continuous Damage
O. Bélaidi Chabane Chaouche, M. Almansba, Y. Labadi and N.E. Hannachi
- 251 Crystal Plasticity Finite Element Modelling of Compression of Pure Aluminum
Z.Y. Jiang, H.J. Li, J.T. Han, D.B. Wei, H.C. Pi and A.K. Tieu
- 252 On the Dynamics of Multifield Structured Continua
M. Bruggi, C. Cinquini and P. Venini
- 253 Numerical Solutions for some Axisymmetric Elastic Micropolar Orthotropic Bodies
A. Taliercio, D. Veber and A. Mola

Polyethylene Materials

- 254 Ring-Stiffness Evaluation and Optimization of Structured-Wall Polyethylene Pipes
F. Fuerle, J. Sienz, M. Innocente, J.F.T. Pittman, V. Samaras and S. Thomas
- 255 Creep Properties of Medium Density Polyethylene and High Performance Polyethylene
Z.W. Guan and J.C. Boot

Constitutive Modelling

- 256 A New Efficient Explicit Numerical Integration of Constitutive Equations:
Application to Sheet Metal Forming Simulations
M. Halilović, M. Vrh and B. Štok

Materials Modelling

- 257 Macro Modeling and Homogenization for Identification of Material Parameters to Simulate Phase Transformations
R. Mahnken, A. Schneidt and T. Andretter
- 258 On the Correlation of Theory and Experiment for Transversely Isotropic Nonlinear Incompressible Solids
M.H.B.M. Shariff, B.A. Mahad and A.A. Zainal

Materials Modelling: Concrete

- 259 Micromechanical Modelling and Optimisation on Cement Paste Performance
V. Šmilauer, Z. Vittingerová, M. Lepš

- 260 Two Scale Modelling of Internally Cured Concrete by Means of Porous Media Mechanics
D. Gawin, M. Wyrzykowski and F. Pesavento
- 261 Numerical Simulation of Textile Reinforced Concrete Using a Microplane-Type Model with Initial Anisotropy
A. Scholzen, R. Chudoba and J. Hegger
- 262 A Comparison of Computational Strategies for Two-Dimensional Analysis of Concrete Specimens
P. Konečný, M. Mynarz and J. Brožovský
- 263 Modelling the Effect of Chloride Binding on Chloride Diffusion in Concrete Structures
A.H. Al-Gadhib, I.A. Mahmoud, M.A. Shazali and M.H. Baluch
- 264 Confluence of Chloride Diffusivity Influence Functions in Unsaturated Concrete
M.A. Shazali, A.H. Al-Gadhib, M.K. Rahman and M.H. Baluch

Space Structures

- 265 Numerical Investigation of a New Aluminium Alloy Reticular Space Structure
A. Formisano and F.M. Mazzolani
- 266 Generating Geometric Configurations of Varax Domes Using Formian
U.A. Girhammar and D.H. Pan
- 267 Feasibility Study of a Large Span Tensegrity Spline Arch Supported Membrane
S. Adriaenssens

Cable-Net, Cable and Tension Structures

- 268 Limit Analysis of Inflatable Beams
J.C. Thomas, M. Chevreuil and C. Wielgosz
- 269 Bimodal Planar Galloping of Suspended Cables in 1:1 Internal Resonance
D. Zulli, A. Luongo and G. Piccardo
- 270 Simplified Numerical Experiments on the Effect of Hysteretic Damping of Cross-Ties on Cable Oscillations
P.G. Papadopoulos, A. Diamantopoulos, P. Lazaridis, H. Xenidis, C. Karayannis and S. Kyrgidis
- 271 Form Finding and Structural Optimization of Tension Structures Using Multi-Objective Genetic Algorithms
S.P. Triantafillou and V.K. Koumousis
- 272 Parameters to be Considered in the Analysis and Design of Cable Nets
H.A. Zien-EIDin, F.A. Fathelbab, E.A. Elkordy and E.E. Hendy
- 273 The Series Iterative Method for Planar Rectangular Prestressed Cable Nets
R.J. Shang, Z.Q. Wu and J.L. Liu
- 274 Post-Elastic Analysis of Prestressed Cable Trusses
S. Kmet and M. Tomko

Offshore Structures

- 275 Offshore wind turbines: Basis of Structural Design
K. Gkoumas, F. Petrini, S. Manenti and F. Bontempi

Automotive Engineering

- 276 Validation Study of Failure Prediction in Crash Analysis
A. Reyes, C. Dørum, O.S. Hopperstad, M. Langseth, O.-G. Lademo and M. Eriksson
- 277 Development of a Granular-Medium-Based Energy Management System for Automotive Bumper Applications
F.-M. Mwangi and K. Kanny

Pavement Analysis and Design

- 278 Dynamic Analysis of a Damaged Flexible Pavement Using the Falling Weight Deflectometer Technique
A. El Ayadi, B. Picoux and C. Petit

Fire Safety Engineering

- 279 Safety Performance Evaluation of Steel Structures Subject to Fire Action Using Non-Linear Analysis
C. Crosti and F. Bontempi
- 280 Risk Analysis and Modelling Techniques for Structural Fire Safety
K. Gkoumas, C. Crosti and F. Bontempi

Bridge Engineering

- 281 Determination of Bridge Natural Frequencies Using a Moving Vehicle Instrumented with Accelerometers and a Geographical Positioning System
A. González, E. Covián and J. Madera
- 282 The Behaviour of a Long Span Suspension Bridge under the Action of Low Frequency Earthquakes
L. Bahbouh, H. Yamada, H. Katsuchi and E. Sasaki
- 283 Dynamic Response of a Multi-Span Continuous Bridge with a Damper Settled on a Bridge Abutment
T. Mazda, H. Miyamoto and Y. Taniguchi
- 284 The Old Steel Bridge: Dynamic Analysis Utilization for Estimating the Bridge Structure Ultimate Capacity
J. Benčat and D. Papán
- 285 Improved Modal Pushover Analysis of Multi-Span Continuous Bridges
H.G. Kwak and D.K. Shin
- 286 Finite Element Analysis of a Composite Steel-Concrete Bridge
T. Chaisomphob, J. Sa-nguanmanasak and E. Yamaguchi

Building Analysis and Design

- 287 On the Modern Use of the Bòvedas Tabicadas
S. Benfratello, A. Caffarelli, L. Palizzolo, F. Giambanco and R. Urso
- 288 Normal Flow Algorithm Method for Modal Adaptive Pushover Analysis of Buildings
R. Tabatabaei, H. Saffari and M.J. Fadaee
- 289 Application of the Digital-Image-Correlation Technique to Measure the Deformation of a Seismic Retrofitted Column for a Two-Storey Building
S.H. Tung, M.H. Shih and Y.S. Yang

- 290 Non-Planar Coupled Shear Walls with Stiffening Beams
E. Emsen, O. Aksogan, R. Resatoglu, M. Bikçe, H.M. Arslan and H. Görgün
- 291 Modeling for Progressive Collapse Mitigation Using Nonlinear Static Analysis Procedures
O.A. Mohamed and M.S. Keshawarz

Modelling Retrofitted and Repaired Structures

- 292 Finite Element Simulation of Reinforced Concrete Beams Strengthened with Externally Bonded Carbon Fibre Reinforced Polymer
C.A. Issa and G.A. Saad
- 293 Computational Analysis for Cable Supported Structures
N. Kiraç and M. Doğan
- 294 A Computational Stiffness Approach for Environmentally Damaged and Cable-Strengthened Metal Structures
K.A. Liolios and A.A. Liolios

Composite Structures

- 295 Optimal Design of Composite Lateral Wing Upper Covers Based on Non-Linear Buckling Analysis
E. Barkanov, S. Gluhih, O. Ozoliņš, E. Eglītis, F. Almeida, M.C. Bowering and G. Watson
- 296 Optimization of Multi-Functional Sandwich Panels Using Genetic Algorithms
X.H. Tan and A.K. Soh
- 297 Numerical Simulations of Ultra-Lightweight Steel-Concrete-Steel Sandwich Composite Panels Subjected to Impact
S.C. Lee, K.M.A. Sohel and J.Y.R. Liew
- 298 A Global Bolted Joint Model for Finite Element Simulations of Large-scale Composite Structures
P.J. Gray and C.T. McCarthy
- 299 Analysis of Two-Layer Elastic Beams Considering Interlayer Slip and Uplift
A. Kroflič, I. Planinc, M. Saje and B. Čas
- 300 Buckling by General Instability of Cylindrical Components of Deep Sea Submersibles
C.T.F. Ross, K.O. Okoto and A.P.F. Little
- 301 Vibration of an Axisymmetric Laminated Cylinder
P.P. Prochazka, A.E. Yiakoumi and S. Peskova
- 302 The Effect of Shear Connectors on the Behaviour of Steel Concrete Composite Beams
Y.A. Daou and O.M. Baalbaki
- 303 Numerical Modelling of Shear Connections for Composite Slabs
N. Seres, A.L. Joó and L. Dunai
- 304 Vibration Analysis of Long Span Joist Floors Submitted to Dynamic Loads from Human Activities
J.G.S. da Silva, P.C.G. da S. Vellasco, S.A.L. de Andrade, L.R.O. de Lima and R.R. de Almeida

Composites: Damage Modelling

- 305 A Three-Dimensional Damage Model for Composites with Non-linear Shear Behaviour
C.T. McCarthy and R. O'Higgins

- 306 A Stochastic Approach to the Damage Resistance Analysis of Stiffened Composite Panels
C. Sellitto, A. Riccio and D. Tescione
- 307 A Novel Directional Damage Model for Composites
J.L. Curiel Sosa

Composite Materials

- 308 The Out-Of-Plane Natural Frequencies of Curved Composite Beams Including the Effect of the Rotary Inertia and Shear Deformation
B. Ayhan and F. Kadioglu
- 309 Critical Buckling of Delaminated Composite Plates Using Exact Stiffness Analysis
M. Damghani, C.A. Featherston and D. Kennedy
- 310 A Random Unit Cell Finite Element Model for the Elastic Modulus of Concrete Composites with Interfacial Transition Zone
S. Abdelmoumen, E. Bellenger, B. Lynge and M. Quéneudec-t'Kint
- 311 Development of a Statistically Equivalent Representative Volume Element for a Fibre Reinforced Composite
T. Vaughan, C. McCarthy and C. Soutis
- 312 The Effect of Matrix Non-linearity on the Properties of Unidirectional Composite Materials for Multi-Scale Analysis
A. Keane, C.T. McCarthy and N.P. O'Dowd
- 313 Modelling Brittle Failure of Glass Fibre Composites Subjected to Static Loading
J. Fan, Z.W. Guan and W.J. Cantwell
- 314 Optimal Design of Laminated Plates with Central Circular Holes
M. Walker and M. Ndebele
- 315 A Numerical Model for the Bending Fatigue Behaviour of Composite Materials
E. Akay and H.S. Türkmen
- 316 Finite Element Modelling of Phenolic Resin Impregnated Aramid Paper Adopted in Foldcore Sandwich Cores
S. Kilchert, A.F. Johnson and H. Voggenreiter
- 317 Compressional Stability Behaviour of Composite Plates with Multiple Through-the-Width Delaminations by Using First Order Shear Deformation Theory
H.R. Ovesy and M. Kharazi
- 318 A Genetic Algorithm Based Blending Scheme for Design of Multiple Composite Laminates
O. Seresta, M.M. Abdalla and Z. Gürdal
- 319 Simulation of Three-Dimensional Interlock Composite Preforming
E. De Luycker, P. Boisse, F. Morestin and D. Marsal
- 320 Response of Circular GLARE Fiber-Metal Laminates under Lateral Indentation
G.J. Tsamasphyros and G.S. Bikakis

Author Index

Keyword Index

Preface

This volume comprises the summaries of contributed papers presented at The Ninth International Conference on Computational Structures Technology (CST 2008) held in Athens, Greece from 2 to 5 September 2008. The full papers from the conference are available on the accompanying CD-ROM. The CST conference series began in Edinburgh during 1991. The 2008 conference was held concurrently with The Sixth International Conference on Engineering Computational Technology (ECT 2008).

The special sessions included in this volume of Proceedings are:

- Modeling and Simulation of Composite and Adaptive Structures
organised by C.M. Mota Soares
- Multi-Scale Numerical Modeling of Engineering Structures
organised by J.Q. Ye and Y. Sheng
- Numerical Design of Protective Structures
organised by N. Gebbeken
- Modelling of Composite Beams
organised by J. Murin
- Mechanics of Composites, Functionally Graded and Piezoelectric Materials
organised by T. Kant
- Spectral and Wave Element Methods for Structural Response Prediction and Damage Detection
organised by J.R. Arruda
- Evolutionary and Non-Deterministic Methods in Structural Optimization
organised by M. Domaszewski
- Stochastic Optimization Methods in Structural Analysis and Optimal Design
organised by K. Marti and G.I. Schuëller
- Soft Computing and Structural Engineering
organised by Y. Tsompanakis and N. Lagaros
- Differential Quadrature, Generalized Methods and Related Discrete Element Analysis Methods
organised by C.N. Chen
- Application of Finite Element Methods for the Analysis and Design of Steel and Concrete Structures
organised by E.S. Mistakidis
- Structural Analysis and Optimization in Acoustics and Vibrations
organised by M. Matos Neves and J.F. Aguilar Madeira
- Probabilistic Approaches and Optimisation for Structural Mechanics
organised by A. Elhami and M. Karama
- Damage Identification
organised by C.A. Papadopoulos
- Computational Tools for Earthquake and Structural Dynamics
organised by S.H. Lo
- Non-Linear Dynamics
organised by M. Amabili

We are particularly grateful to the organisers of these special sessions.

The following sessions are also included in this volume:

- Finite Element Methods
- Finite Elements: Plasticity
- Finite Elements: Modelling and Design
- Boundary Element Methods
- Plate Problems
- Damage and Identification Problems
- Shakedown Analysis and Design
- Analysis of Trusses, Frames and Space Structures
- Structural Optimization
- Shape and Topology Optimization
- Reliability Design
- Reliability Analysis and Modelling
- Probabilistic Engineering Problems
- Dynamics and Vibration
- Passive Damping Systems
- Seismic Engineering
- Wave Propagation Problems
- Contact-Impact Problems
- Steel Structures
- Reinforced Concrete Structures: Design
- Reinforced Concrete: Analysis
- Fibre Reinforced Concrete
- Shell Structures
- Masonry Structures
- Crack Propagation: Modelling
- Timber Structures
- Microstructures: Analysis and Modelling
- Polyethylene Materials
- Constitutive Modelling
- Materials Modelling
- Materials Modelling: Concrete
- Space Structures
- Cable-Net, Cable and Tension Structures
- Offshore Structures
- Automotive Engineering
- Pavement Analysis and Design
- Fire Safety Engineering
- Bridge Engineering
- Building Analysis and Design
- Modelling Retrofitted and Repaired Structures
- Composite Structures
- Composites: Damage Modelling
- Composite Materials

Other papers presented at the conferences in 2008 are published as follows:

- *The Invited Lectures from CST 2008 are published in:*
Trends in Computational Structures Technology, B.H.V. Topping and M. Papadrakakis, (Editors), Saxe-Coburg Publications, Stirlingshire, Scotland, 2008.
- *The Invited Lectures from ECT 2008 are published in:*
Trends in Engineering Computational Technology, M. Papadrakakis and B.H.V. Topping, (Editors), Saxe-Coburg Publications, Stirlingshire, Scotland, 2008.
- *The Contributed Papers from ECT 2008 are published in:*
Proceedings of the Sixth International Conference on Engineering Computational Technology, M. Papadrakakis and B.H.V. Topping, (Editor), (Book of Summaries and CD-ROM), Civil-Comp Press, Stirlingshire, Scotland, 2008.

We should like to thank the members of the CST 2008 Conference Editorial Board for their help before and during the conference: Prof. H. Adeli, USA; Prof. S. Adhikari, UK; Prof. J.F. Aguilar Madeira, Portugal; Prof. M. Amabili, Italy; Prof. T. Aoki, Japan; Dr R. Ardito, Italy; Prof. A.J. Aref, USA; Prof. F. Armero, USA; Prof. J.R. Arruda, Brazil; Dr A.F. Ashour, UK; Prof. H. Askes, UK; Prof. N.O. Attoh-Okine, USA; Dr C.E. Augarde, UK; Prof. J. Awrejcewicz, Poland; Dr A. Bahreininejad, Iran; Prof. C.C. Baniotopoulos, Greece; Prof. A. Baratta, Italy; Prof. H.J.C. Barbosa, Brazil; Assoc. Prof. E. Barkanov, Latvia; Prof. R.C. Barros, Portugal; Prof. K.J. Bathe, USA; Prof. Z.P. Bazant, USA; Prof. A.A. Becker, UK; Prof. T. Belytschko, USA; Prof. A. Benjeddou, France; Prof. N. Bicanic, UK; Prof. M.L. Bittencourt, Brazil; Prof. Z. Bittnar, Czech Republic; Dr J. Blachut, UK; Prof. D. Boffi, Italy; Prof. P. Boisse, France; Prof. M. Bonnet, France; Prof. F. Bontempi, Italy; Assoc. Prof. B. Boroomand, Iran; Prof. Ph. Bouillard, Belgium; Prof. M.A. Bradford, Australia; Dr M. Brunig, Germany; Dr J.W. Bull, UK; Dr C. Butenweg, Germany; Prof. F. Buyle-Bodin, France; Prof. D. Camotim, Portugal; Prof. E. Carrera, Italy; Prof. F. Casciati, Italy; Prof. G. Cederbaum, Israel; Prof. J.M.A. Cesar de Sa, Portugal; Prof. A.H.C. Chan, UK; Dr S. Chandra, India; Prof. C.-N. Chen, Taiwan; Prof. W.F. Chen, USA; Prof. G.D. Cheng, China; Prof. R.C. Cheng, USA; Prof. G. Chiandussi, Italy; Prof. C. Cinquini, Italy; Prof. H.B. Coda, Brazil; Prof. J.Y. Cognard, France; Prof. G.J. Creus, Brazil; Prof. M. Cuomo, Italy; Prof. V.D. da Silva, Portugal; Prof. S. De, USA; Prof. R. de Borst, Netherlands; Prof. J.A.T. de Freitas, Portugal; Prof. G. De Roeck, Belgium; Prof. G. de Saxca'e, France; Dr Z. Dimitrovová, Portugal; Prof. I. Doltsinis, Germany; Prof. M. Domaszewski, France; Dr J. Dominguez, Spain; Prof. J. Duane, USA; Prof. L. Dunai, Hungary; Prof. J. Eberhardsteiner, Austria; Prof. A. El-Hami, France; Prof. A. Eriksson, Sweden; Dr D. Eyheramendy, France; Dr P. Fanning, Ireland; Prof. C.A. Felippa, USA; Prof. M. Fivel, France; Prof. D.M. Frangopol, USA; Prof. M.I. Friswell, UK; Prof. G. Gambolati, Italy; Prof. L. Gastaldi, Italy; Prof. V. Gattulli, Italy; Prof. Dr-Ing. N. Gebbeken, Germany; Prof. J.-C. Gelin, France; Prof. R.G. Ghanem, USA; Prof. R.I. Gilbert, Australia; Prof. D. Givoli, Israel; Prof. P. Gosling, UK; Prof. R.V. Grandhi, USA; Prof. D.E. Grierson, Canada; Prof. A.A. Groenwold, South Africa; Dr Z.W. Guan, UK; Prof. R.M. Guedes, Portugal; Prof. I. Hagiwara, Japan; Prof. P. Hajela, USA; Prof. P. Hamelin, France; Prof. H.-J. Hardtke, Germany; Prof. R. Harte, Germany; Prof. G.R. Heppler, USA; Prof. G. Hofstetter, Austria; Prof. O.S. Hopperstad, Norway; Prof. T.J.R. Hughes, USA; Dr L. Iannucci, UK; Prof. A. Ibrahimbegovic, France; Prof. N. Inoue, Japan; Dr I. Iskhakov, Israel; Prof. A. Ivankovic, Ireland; Dr P. Ivanyi, Hungary; Prof. B.A. Izzuddin, UK; Prof. M. Jirasek, Czech Republic; Prof. M. Kaliske, Germany; Dr E.S. Kameshki, Bahrain; Dr M. Kaminski, Poland; Prof. T. Kant, India; Prof. J.D. Kaplunov, UK; Prof. D.L. Karabalis, Greece; Prof. M. Karama, France; Prof. J.T. Katsikadelis, Greece; Prof. A. Kaveh, Iran; Dr D. Kennedy, UK; Dr A.I. Khan, Australia; Prof. P.H. Kirkegaard, Denmark; Prof. U. Kirsch, Israel; Prof. M. Kleiber, Poland; Prof. L.Yu. Kossovich, Russia; Prof. M.D. Kotsovos, Greece; Prof. W.B. Kraetzig, Germany; Dr J. Kruijs, Czech Republic; Prof. H.G. Kwak, Korea; Dr A.S.K. Kwan, UK; Prof. Y.W. Kwon, USA; Prof. R. Lackner, Germany; Prof. P. Ladeveze, France; Dr N. Lagaros, Greece; Prof. K.L. Lawrence, USA; Prof. D. Le Houédec, France; Dr C.K. Lee, Singapore; Dr C.J. Leo,

Australia; Prof. A.Y.T. Leung, Hong Kong; Prof. R. Levy, Israel; Prof. R. Lewandowski, Poland; Prof. R.W. Lewis, UK; Prof. J.Y.R. Liew, Singapore; Prof. K.M. Liew, Hong Kong; Prof. A. Liolios, Greece; Prof. S.H. Lo, Hong Kong; Prof. J. Logo, Hungary; Dr P.B. Lourenco, Portugal; Prof. J. Lu, USA; Prof. R. Mahnken, Germany; Prof. C.E. Majorana, Italy; Prof. H.A. Mang, Austria; Prof. Dr K. Marti, Germany; Prof. M. Matos Neves, Portugal; Prof. K. Maute, USA; Prof. I.M. May, UK; Prof. F.M. Mazzolani, Italy; Dr C.T. Mc Carthy, Ireland; Prof. T.J. McCarthy, Australia; Prof. G. McClure, Canada; Dr G. Mejak, Slovenia; Prof. C. Meyer, USA; Dr G. Milani, Italy; Assoc. Prof. E.S. Mistakidis, Greece; Prof. A. Miyamoto, Japan; Prof. F.J. Montans, Spain; Prof. C.A. Mota Soares, Portugal; Prof. C.M. Mota Soares, Portugal; Prof. J. Murin, Slovakia; Prof. G. Muscolino, Italy; Prof. J.-P. Muzeau, France; Prof. C. Navarro, Spain; Dr L.A.C. Neves, Portugal; Prof. L.F. Costa Neves, Portugal; Prof. G.P. Nikishkov, Japan; Prof. R. Ohayon, France; Prof. E. Oñate, Spain; Prof. C.A. Papadopoulos, Greece; Prof. M. Papadrakakis, Greece; Prof. P.Y. Papalambros, USA; Dr B. Patzak, Czech Republic; Prof. M.N. Pavlovic, UK; Dr C. Pearce, UK; Prof. S. Pellegrino, UK; Prof. J. Petrolito, Australia; Prof. Y. Petryna, Germany; Dr J. Plesek, Czech Republic; Prof. M. Potier-Ferry, France; Assoc Prof. Ch. G. Provatidis, Greece; Prof. C.P. Providakis, Greece; Dr O.M. Querin, England; Prof. C.V. Ramakrishnan, India; Prof. F.G. Rammerstorfer, Austria; Prof. O. Rand, Israel; Prof. E. Rank, Germany; Prof. M. Raoof, UK; Prof. B.D. Reddy, South Africa; Dr Y. Ribakov, Israel; Dr P. Ribeiro, Portugal; Dr A. Riccio, Italy; Prof. H. Rodrigues, Portugal; Prof. Dr-Ing. habil R. Rolfes, Germany; Prof. C.T.F. Ross, UK; Prof. G. Rozvany, Hungary; Dr D. Rypl, Czech Republic; Prof. E. Sacco, Italy; Prof. M. Saje, Slovenia; Prof. E. Salajegheh, Iran; Prof. L.M. Santos Castro, Portugal; Assoc. Prof. E.J. Sapountzakis, Greece; Prof. E. Schnack, Germany; Prof. B. Schrefler, Italy; Prof. G.I. Schuëller, Austria; Prof. K. Schweizerhof, Germany; Dr O. Shai, Israel; Prof. S.K. Sharan, Canada; Dr M.H.B.M. Shariff, UAE; Dr Y. Sheng, UK; Dr R.C. Silva, Brazil; Prof. L. Simoni, Italy; Prof. S.W. Sloan, Australia; Prof. J.D. Sorensen, Denmark; Prof. J.E. Souza de Cursi, France; Prof. E. Spacone, Italy; Dr R. Spallino, Germany; Prof. E. Stein, Germany; Prof. B. Stok, Slovenia; Prof. Y. Sugiyama, Japan; Dr C.C. Swan, USA; Prof. B.A. Szabo, USA; Prof. K.Y. Sze, Hong Kong; Dr K. Tai, Singapore; Prof. I. Takahashi, Japan; Prof. I. Takewaki, Japan; Prof. S. Tanaka, Japan; Prof. T. Tarnai, Hungary; Prof. J.W. Tedesco, USA; Dr A. Tessler, USA; Prof. G. Thierauf, Germany; Prof. R. Tinawi, Canada; Prof. B.H.V. Topping, UK; Prof. V.V. Toropov, UK; Dr J. Trevelyan, UK; Prof. G. Tsamasphyros, Greece; Asst. Prof. Y. Tsompanakis, Greece; Dr G.J. Turvey, UK; Prof. V. Tvergaard, Denmark; Prof. R. Veldman, USA; Prof. P. Venini, Italy; Prof. W. Wagner, Germany; Prof. X. Wang, USA; Prof. N.-E. Wiberg, Sweden; Prof. M. Wiercigroch, UK; Prof. K.S. Woo, Korea; Prof. W. Wunderlich, Germany; Dr J.R. Xiao, USA; Dr Q. Xiao, UK; Dr R.Y. Xiao, UK; Prof. Y.M. Xie, Australia; Prof. Y.-B. Yang, Taiwan; Dr J.Q. Ye, UK; and Prof. A. Zingoni, South Africa.

Finally, we are grateful to Jelle Muylle for designing these conference proceedings and for all his administrative and organisational skills in organising these conferences. We also wish to thank Dawn Sewell (Civil-Comp Press) and Jenny Mitsoura (National Technical University of Athens) for their administrative support before and during the conference.

Prof. B.H.V. Topping
Heriot-Watt University, Edinburgh, UK
& University of Pécs, Hungary

Prof. M. Papadrakakis
National Technical University of Athens, Greece