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NEW ASPECTS OF ENGINEERING MECHANICS, STRUCTURES, ENGINEERING GEOLOGY

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Mathematics and Computers in Science Engineering
A Series of Reference Books and Textbooks

Proceedings of the WSEAS International Conference on ENGINEERING MECHANICS, STRUCTURES, ENGINEERING GEOLOGY (EMESEG '08)

Heraklion, Crete Island, Greece, July 22-24 2008

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Preface

This book contains the proceedings of the WSEAS International Conference on ENGINEERING MECHANICS, STRUCTURES, ENGINEERING GEOLOGY (EMESEG '08) which was held in Heraklion, Crete Island, Greece, July 22-24, 2008. This conference aims to disseminate the latest research and applications in Mechanical Engineering , Structures, Engineering Geology,Fluid-Structure Interaction, Geomechanics and Mechanics of Granular Materials, Nonlinear Dynamics, Structural Dynamics and Control, Dynamic Instability and Buckling, Vibrations, Acoustics, and Noise Control, Earthquake Engineering, Geoinformative and Geodetic Methods of Measurements and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

Table of Contents

Plenary Lecture I: Modeling Muddy Flash Floods and Debris Flows **14**
Blaise Nsom

Plenary Lecture II: The use of Integral Transforms for analytic solution of Pre-stressed Thin Plate on Elastic Foundation under Axisymmetric Loading **15**
Dimitrios G. Pavlou

Plenary Lecture III: On the Eigenvalues Optimization of Beams with Damping Patches **16**
Veturia Chiroiu

Plenary Lecture IV: In Depth Analysis of the Analogies among Entropy, Information and Sensation. The Concept of Time in Thermodynamics **17**
Vassilis Gekas

Implementation of Clean Development Mechanism (CDM) Methodologies in Natural Gas CHP Plants **19**
Dragan Urosevic, Veroslav Jankovic, Dejan Djukanovic, Filip Kulic

New Approaches on Predictive Maintenance Based on a Renewable Perspective for Wind Generators **26**
Torres Farinha, Inácio Fonseca, Maciel Barbosa

Prediction of Face Settlement During Tunneling Excavation Using Artificial Neural Network **33**
George J. Tsekouras, John Koukoulis, Maria-Katerina Nikolinakoy, Nikos E. Mastorakis

In-depth Analogies among Entropy, Information and Sensation. The concept of Time in Thermodynamics **40**
Georges Maniatis, Eustathios Reppas & Vassilis Gekas

Stress Concentration Analysis of Rocks Containing Interfacial Cracks under Internal Singular Loading Sources **45**
Lucaci G., Bancila R., Belc F., Tîrtea A., Pavlou D. P.

Extended Displacement Discontinuity Method of Two Dimensional Magnetoelectroelastic Media **54**
Zhao Minghao, Fan Cuiying, Li Na, Chen Feng

Investigation into the Geometrical Parameters of a Thermal Fatigue Crack Pattern **61**
P. Yasniy, I. Konovalenko, P. Maruschak

Strengthening of Reinforced Concrete Framed Structures in Seismic Zones by Using CFRP **67**
Sorin Dan, Corneliu Bob, Aurelian Gruin, Catalin Badea, Liana Iures

The Power of Digital Image Correlation for Detailed Elastic-Plastic Strain Measurements **73**
H.J.K. Lemmen, R.C. Alderliesten, R. Benedictus, J.C.J. Hofstede, R. Rodi

Experimental Studies on Steel and Steel Concrete Composite Joints for Buildings **90**

D. Dan, V. Stoian, T. Nagy-gyorgy, C. Florut, I. Demeter, D. Pavlou

Analysis of Reinforced Concrete Existing Structures in Seismic Regions **96**
Sorin Dan, Corneliu Bob, Aurelian Gruin

NASIR Explicit Matrix Free Galerkin Finite Volume Solver for Analyzing Arbitrary Shaped Solid Mechanics Problems on Unstructured Triangular Meshes **104**
Saeed-reza Sabbagh-yazdi, Mehdi Esmaeili

Bifurcation Phenomena for Two-Sided Non-Facing Lid Driven Cavity Flow **111**
Essam Wahba

On the Eigenvalues Optimization of Beams with Damping Patches **117**
Veturia Chiroiu

Fuzzy Control of Oceanic Structures Subjected to External Force **123**
Cheng-Wu Chen

A Distributed Memory Implementation for Solving the Static Problem on the Pantograph/Catenary Interaction **131**
A. Alberto, E. Arias, J. Benet, T. Rojo, F. Cuartero, P. Tendero

The Optimization of Surface Quality in Rapid Prototyping **136**
Mircea Ancău & Cristian Caizar

An Integration of Close-Range Photogrammetry and CAD System for Cultural Monuments: Preliminary Findings **142**
Seyed Yousef Sadjadi

Application of Digital Photogrammetry and AUTOCAD to Support of Historical Buildings **151**
Seyed Yousef Sadjadi

Three-Dimensional Modelling of Building Using Photogrammetrically Derived Coordinates are Demonstrated **157**
Seyed Yousef Sadjadi, Jane Elizabet Drummond

A Geospatial Approach to Build up Monuments Using GIS and Digital Photogrammetry **164**
Seyed Yousef Sadjadi, A. K. Haghi

An Investigation of Architectural and Archaeological Tasks Involving Digital Terrestrial Photogrammetry **170**
Seyed Yousef Sadjadi

The Effect of Vibration and Amplitude of Vibration on the Coefficient of Friction for Metals **179**
Jamil Abdo, Mahmoud Tahat

Inversion of 2D DC Resistivity Data for High Resistivity Contrast Regions Using Artificial Neural Network **186**
A.Neyamadpour, Samsudin Taib, W.A.T.Abdullah

Virtual Engineering for Rapid Product Development **195**

Petru Berce, Razvan Pacurar, Nicolae Bâlc

Increasing the Contribution of Strong Panel Zones to the Plastic Deformation Capacity of Post-Northridge Welded Connections **201**
Amir A. Hedayat, Murude Celikag

Aspects about the Influence of the Lubricant from a Rectilinear Pair Above the Work Accuracy of the Elastic Elements from the High Precision Mechanisms **209**
Madalina Calbureanu, Raluca Malciu, Romulus Lungu, Dan Calbureanu

Aspects about Projecting a Multiple Designs of Self-Supporting Metallic Structure Using Finite Element Method in Determination the Buckling Factor and Running the Stress Analysis **215**
Madalina Calbureanu, Raluca Malciu, Romulus Lungu, Dan Calbureanu

Exergetic Analyze for the Cryogenic Cycle Uses into the Experimental Pilot Plant for Tritium and Deuterium Separation **221**
Sorin Gherghinescu

Practical Aspects Regarding the Design of Intelligent Systems Using the Shape Memory Alloy Spring **226**
Sonia Degeratu, Nicu G. Bizdoaca, Gheorghe Manolea, Ilie Diaconu, Anca Petrisor, Vasile Degeratu

About Ankle-Foot Orthosis Optimization **232**
Mircea Badescu, Ioan Bondrea, Achim Muntean

Scattering of Plane SH Waves by a Thin-Walled Inclusion **237**
Volodymyr Emets, Jan Rogowski

Hidden Fault Location in Nimroud Dam Site Using Seismic Tomography **246**
Kambiz Teimoornegad , Neda Poroohan

Propagation of Newtonian or Shear Thinning Liquid over the Free Surface of Salty Water at Rest in a Basin **252**
N. Latrache, A. Ahmad, B. Nsom & K. Bouchlaghem

Mathematical Modeling of Crown Forest Fire Initiation **259**
Valeriy Perminov

Large Eddy Simulation of Vortex Pair Submitted to Ground Effect **265**
Cristian-Emil Moldoveanu, Andre Giovannini, Henri-Claude Boisson,Florentin Moraru

Structural Design of Buildings to Resist Blast and Progressive Collapse (Case Study: Main Substation Building Located at Esfahan Refinery Plant in Iran) **271**
Javad Yazdanseta, Mahbobe Taheri

Usage of non-Euclidean Model for Description of Rock **276**
Mikhail Guzev, Vladimir Makarov

Mechanical Behavior of an Advanced Sandwich Composite Structure **280**
Horatiu Teodorescu, Sorin Vlase, Dana Luca Motoc, Ionatan Popa, Dorin Rosu, Florin Teodorescu

Modelling Muddy Flash Floods and Debris Flows **286**
B. Nsom

Investigation of Large Scale Slope Failure Mechanisms and Numerical Modeling for the Safe Design of Slopes in a Lignite Mine **292**
Levent Tutluoglu, Celal Karpuz

Effects of the Ocean Stratification on the Rotative and the Convective Instabilities **301**
H. Mangel, B. Nsom and R. Dussin

Characterization of Sea Breezes and their Effects on Air Pollution in the Tunisian Mediterranean Region **307**
Karim Bouchlaghem, Blaise Nsom, Noureddine Lattrache, Houda Haj

On Vehicles Pitch Stability Increasing **313**
Adrian-Ioan Niculescu, Dan Dumitriu, Tudor Sireteanu

On Optimal CFD Scheme for the Simulation of Air Pollutant Dispersion Near or Around Buildings **319**
X. Wang and K.F. McNamara

A Population Replacement Strategy Analysis in Multi-objective Optimum Design of Structural Metallic Frames **340**
David Greiner, Jose M. Emperador, Gabriel Winter, Blas Galván

Nonlinear Behavior of Pile-Soil Subjected to Torsion due to Environmental Loads on Jacket Type Platforms **346**
M. R. Emami Azadi, S. Nordal, M. Sadein

On Diagnosis of Brake Mechanism of Hoisting Machines **352**
Vilhelm Itu, Mihai Carmelo Ridzi, Iosif Dumitrescu

Stress and Displacements in the Structure of the Extracting Towers **358**
Iosif Dumitrescu, Mihai Carmelo Ridzi, Vilhelm Itu

A Computer-Aided Optimization Method of Bending Beams **364**
Carmen E. Eisinger-Borcia

Investigate the Active Faults, Sinkholes at the Eastern Shores of the Dead Sea By Using Electromagnetic Radiation (EMR) **370**
Emad Akawwi

Combined Management of Eolian and Water Management through Coupling of RO Desalination and Wind Energy **379**
A. Perysinaki and V.Gekas

Static Stability Evaluation of Stone Pagoda Considering Frictional Characteristics of Stone Blocks **385**
Jung-Tae Noh, Hack-Jin Kim, Sang-Hyun Lee, Seung-Ho Cho, Lan Chung

Equivalence between Linear and Curved Sources in Newtonian Fields: Acoustics Applications **393**

J. Quartieri, L. Sirignano, C. Guarnaccia

Author Index **396**

Plenary Lecture I

Modeling Muddy Flash Floods and Debris Flows

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Abstract: After long and intense rains in a mountainous region, large quantities of water flow in the torrents. For some reason, this flow can be obstructed by cross-linked branches and debris (natural dam). When the hydrostatic pressure exerted by the fluid exceeds a given yield value, the dam collapses and the fluid is released inside and outside the torrent bed, as well. Such scenario known as a dam-break flow can describe the initiation of certain geological flows, (debris flows, mudflows, etc.). As for any gravity current, the flow description depends on the time scale. Immediately after the dam collapse, the inertial forces are the dominant ones and this configuration can model a flah flood. Flash floods develop at time and space scales that conventional observation systems are not able to monitor, so reliable modelling remains a crucial step. At larger time scale, a viscous regime takes place where the viscous forces become the dominant ones and this configuration can model a classical debris flow. Debris floods develop in a long domain, i.e. a domain of space that is much longer than it is wide. They generally erode their bed and transport much energy and can move rocks and boulders upon very long distances. Both, the flash floods and the debris floods constitute dangerous phenomena for public safety and quality of life. The originality of the present approach is to consider these two flood waves as special cases of a single global model of a dam-break flow of a muddy fluid; depending on the time scale. The study was experimental, analytical and numerical, as well. The experimental study consisted in designing model fluids to be used in the laboratory experiments, characterizing these synthetic muds and monitoring the corresponding dam-break flows in the laboratory. While the theoretical study consisted in stating the equations of motion governing the different flows studied, and solving them in their non dimensional form, both analytically and numerically.

Brief Biography of the Speaker: Professor of Mechanics at the University of Brest (France). Obtained one Ph.D. in Aerothermics at the University of Toulouse in 1981 and another Ph.D. in Hydrodynamics at the University of Metz in 1987. He obtained the “Prix des Sciences de l’Académie Nationale de Metz” in 1988. Nsom has been Assistant Professor at Metz and Associate Professor at Chambéry/Grenoble in 1994 and became Professor in 2000 at Brest. He is Director of Laboratory of Mechanical and Electrical Engineering, Member of the University Senate, Member of the Steering Committee of the Technopôle Brest Iroise in charge of the “Mechanics and Materials” panel. Nsom is presently the President of the Commission charged to appoint the Assistant Professors and the Professors in Mechanics, Engineering Mechanics and Civil Engineering at University of Brest. Nsom has been Expert Evaluator of EU projects, he is presently Coordinator of the EU sub-project “Coatal Risks” in the “InterMareC” programme. He also coordinated a Report to the EU Commission on “Rheology of Debris Flows” and he is participant in national projects as well. He has supervised 7 Ph.D. theses and he has chaired national conferences and co-organized a IUTAM symposium. His field of research concerns modelling and experimental investigations in complex fluid flows, with application to natural hazards and process. He is author or co-author of about 90 publications and communications in national and international conferences. His 2 last papers were published this year (2007) in Physics of Fluids (Stability of Couette Flow of a Stratified Fluid) and in Applied Rheology (Physical and Mechanical Characterization of Soya, Colza and Rye Seeds).

Plenary Lecture II

The use of Integral Transforms for analytic solution of pre-stressed thin plate on elastic foundation under axisymmetric loading

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Abstract: In the past, the model of a thin plate on an elastic foundation was mainly used in structural applications. Currently, thin plates or films of metal, ceramic or synthetic materials are bonded in the surface of machine structural parts or electronic devices to improve their mechanical, thermal, electronic or tribological properties. At these applications, the sub-grade of the thin plate can be simulated as a Winkler-type foundation, which reacts with pressure proportional to the deflection of the plate at each point. The plates in the above applications are loaded by vertical (distributed or concentrated) loads or bending moments, as well as by in-plane forces (compressed or stretched) due to e.g. temperature effects. A large number of analytical or numerical research works have been published to solve several boundary value problems of a classical thin plate or a thin plate on an elastic foundation. However, few research works have been published concerning the differential equation of a pre-stressed thin plate on an elastic foundation, due to its complexity. In the present work, an exact solution of the problem of an infinite circular thin plate on an elastic foundation under combined axisymmetric vertical and radial in-plane forces is attempted. For this purpose, the Hankel's integral transforms and generalized functions properties are used. Numerical examples are included.

Brief Biography of the Speaker: Dimitrios G. Pavlou is Professor of Metallic Structures and Applied Mechanics in the Faculty of Mechanical Engineering of the Technological Institute of Halkida –TEI Halkidas– Greece (website: www.teihal.gr). Undergraduate degree in Mechanical Engineering and PhD in Fracture Mechanics at the University of Patras. He has extensive industrial experience in engineering design and many years of experience in teaching Strength of Materials (theory and experimental exercises), Fracture Mechanics, Metallic Structures, Structural Analysis and Material Science at the Hellenic Air-Force Academy, University of Piraeus, University of Patras and Technological Institute of Halkida. He has been the General Manager of the VIOTE S.A. (Viotia's Prefecture Company for Industrial Development), Head of the Secretary of the Research Centre of the University of Piraeus and Chair of the Faculty of Mechanical Engineering of the Technological Institute of Halkida. Pavlou has been on the Faculty of the TEI of Halkida since 1999 and is currently Visiting Professor in the "Polytechnic" University of Timisoara, Romania. He is (a) author of numerous research articles in referee journals and international conferences, (b) author of national and international books covering fracture mechanics, metallic structures, damage mechanics and strength of materials, and (c) referee of numerous research works submitted in international journals and conferences. His research interests are (a) Analytical and Numerical methods in Fracture Mechanics with special emphasis in solution of Boundary Integral Equations (BIE) using Green's functions and BEM, (b) Damage Mechanics with special emphasis in Fatigue and Creep Damage Accumulation under variable loading as well as life-time prediction of structural parts in service conditions, and (c) Analysis of elastostatic problems using Integral Transforms with special emphasis on Hankel Transforms.

Plenary Lecture III

On the eigenvalues optimization of beams with damping patches

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Abstract: The paper discusses the behavior of beams with external nonlocal damping patches. Unlike ordinary local damping models, the nonlocal damping force is modeled as a weighted average of the velocity field over the spatial domain, determined by a kernel function based on distance measures. The performance with respect to eigenvalues is discussed in order to avoid resonance. The optimization is performed by determining the location of patches from maximizing eigenvalues or gap between them.

Brief Biography of the Speaker: Veturia Chiroiu (born in 1942) received the PhD degree in Mathematics from University of Bucharest in 1981. Since 1966 she is a senior scientific researcher at the Institute of Solid Mechanics of the Romanian Academy, head of Department of Deformable Media (www.imsar.ro). She received a Fulbright Fellowship to work at the Princeton University, Dept. of Aerospace and Mechanical Science (1972–1973), and has led various research projects (Copernicus, NATO) and lectured in foreign institutes and universities. She is author of numerous research articles in referee journals and international conferences, covering dynamics of deformable media, acoustics, intelligent structures and materials, and inverse problems. She is the winner of the prize Aurel Vlaicu of the Romanian Academy in 1997. Since 2000 she is a PhD advisor in the field of mechanical engineering at the Romanian Academy. Since 2004 she is an Honorific Member of the Technical Sciences Academy of Romania (ASTR).

Plenary Lecture IV

In Depth Analysis of the Analogies among Entropy, Information and Sensation. The Concept of Time in Thermodynamics

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Abstract: In teaching Thermodynamics, to analyse the analogies of Entropy, Information, Sensation it might be proven very useful in helping the overall understanding of the students of those difficult concepts. Indeed all those three properties are expressed by similar equations, essentially the same one famous S=klnW equation , the only "epitymbion" equation (that is the equation which is engraved in the tomb of a Human, Ludwig Boltzmann). The teacher , to our opinion, should highlight and analyze the similarities and the differences of the various forms of this equation when applied to Entropy (Boltzmann) Information (Shannon) and Sensation (Heffner-Weber) respectively. The chemical and geometrical aspects of Sensation will be discussed, too. This lecture is based on the main idea that an additative accumulation in the W variable produces an increased Intensity of a feeling in the S variable which is logarithmically related to W. Beyond these three forms mentioned above an extension in to the concept of Time, a rather obscure and mysterious variable in the field of Thermodynamics, both the objective Time and the perceived Time (the "temps vaicu" in french, the Time as it is felt by Man.

Brief Biography of the Speaker: MSc Chemical Engineer NTUA Athens 1971, PhD Food Engineering, Lund , 1987, Sweden. Vassilis Gekas is Professor of Transport Phenomena and Director of the Transport Phenomena & Environmental Thermodynamics at the Technical University of Crete.
He gained international reputation in the Membrane Technology both the synthetic and biological membranes. Author of the CRC edited book of "Transport Phenomena of Foods and Biological Materials " , boca Ratomn FL, 1992. Author of several books in Greek. He was the first to be chairman of the Environmental Engineering dpt , 1984- 2003. He deals with teaching and research in the following fields: Renewal energy sources, desertification, unit operations with developing of Greek raw materials , recovery of high added value constituents from agro-food wastes, enzymatic conversion of starch, thermal treatment of solid wastes, solar cooling. His approximately 50 publications in international journals gained the attention of approximately 1000 colleagues (CI=1000).