Editors: N. Mastorakis, V. Mladenov, Z. Bojkovic

New Aspects of Fluid Mechanics, Heat Transfer & Environment

8th IASME /WSEAS International Conference on Fluid Mechanics & Aerodynamics (FMA '10)

8th IASME /WSEAS International Conference on Heat Transfer, Thermal Engineering and Environment (HTE '10)

Taipei, Taiwan, August 20-22, 2010

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Preface

This year the 8th IASME /WSEAS International Conference on FLUID MECHANICS & AERODYNAMICS (FMA '10) and the 8th IASME /WSEAS International Conference on HEAT TRANSFER, THERMAL ENGINEERING and ENVIRONMENT (HTE '10) were held in Taipei, Taiwan, August 20-22, 2010. The conferences remain faithful to their original idea of providing a platform to discuss mathematical modeling in fluid mechanics, simulation in fluid mechanics, numerical methods in fluid mechanics, convection, heat and mass transfer, experimental methodologies in fluid mechanics, thin film technologies, multiphase flow, boundary layer flow, material properties, biofluids, non-newtonian fluids, waste management, environmental protection, ocean engineering, water resources management, heat and mass transfer, refrigeration, air-conditioning, transport phenomena, conduction problems, steam generators, metal casting, heat exchangers, heat storage, climatology, geoscience, solar energy, atmospheric chemistry, recycling, coastal erosion and sedimentation, food contamination, alternative fuels etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Analysis of a Second Grade Viscoelastic Fluid Past a Square Cavity in a Horizontal Channel

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Abstract: This text studies second grade viscoelastic fluid past a cavity in a horizontal channel. Various flow patterns were studied by changing Reynolds number, elastic coefficient and cavity length. The results of the steady state viscoelastic fluid flow characteristics were obtained.
The analysis reveals that by changing the elasticity coefficient and Reynolds number, the recirculation height reduces in the cavity. The flow patterns were shown due to the influence of the Reynolds number and the elastic coefficient. When the relative height of the backward-facing step and the forward-facing step of the cavity changed, the flow pattern the cavity flow would changed and the recirculation position in the cavity also changed.

Brief Biography of the Speaker:
Kuang-Yuan Kung is a professor of the Department of Mechanical Engineering at Jhongli City, Nanya Institute of Technology, Taiwan. He got master degree from Feng Chia University in Mechanical Engineering major at 1985 and Dr. Degree from Chung-Yuan Christian University in Mechanical Engineering major at 1996.His area of expertise is the heat transfer aspects of advanced manufacturing technology and differential equation analysis. He authored or co-authored over 60 scientific papers published in reviewed journals or presented at international conferences. He had the opportunity to be a visiting researcher at National Taiwan University of Science and Technology and he is a member of editorial advisory board of the Open Ocean Engineering Journal.

Plenary Lecture 2

Electrically Forced Jet Instabilities and Applications

Professor Daniel N. Riahi
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also with:
Department of Mathematics
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Abstract: In this lecture we first review mathematical modeling and analyses that have been carried out in the past for electrically forced jet flow systems and the associated instabilities with important applications in electro-spinning. Next, we consider the relevant governing equations for both linear and nonlinear electrically driven jet flows and their associated temporal and spatial instabilities. Under certain assumptions, scaling and conditions, we will derive mathematical models for the linear & nonlinear stability systems. We then determine linear and nonlinear solutions for some modes of instabilities of the resulting systems. We explain the properties of these solutions and conditions under which they can be dominant. We also compare the results with the available experimental results. We point out at future studies, directions and important questions that need to be resolved by future investigations on this topic.

Brief Biography of the Speaker:
Daniel N. Riahi served as Full Professor at The University of Illinois at Urbana-Champaign (UIUC) from 1995 to 2005, as Professor Emeritus at UIUC since 2005 with the home Dept of Mechanical Science and Eng (MechSE), and as Full Professor in the Dept of Math at University of Texas-Pan American since 2006. Dr. Riahi's research work & interest include studies in convection, flow instabilities & turbulence, flow during solidification & crystal growth, electromagnetic applications, and math modeling and theoretical developments with applications to eng and physical sciences. His research accomplishments include new theories and a number of discoveries in fundamental areas of convective and shear flows, some of which were already confirmed by the experimental studies.
Professor Riahi received Appreciation Letters, Service Recognition Award & Certificates, Honorific Title Award & Research Awards from UIUC. He is member of over seven professional societies and a Fellow of Wessex Institute of Great Britain. He is author of Chapters in a book that won the Best Basic Science Book-Award by IAA. He was awarded NSF Grants, UIUC-RB & UTPA-FRC Grants, NCSA Awards and supervised NASA Sponsored Res. Projects. He presented many Invited Lectures and several Plenary Lectures at National & International Conferences. He is Editor and Editorial Board Member of over 20 technical journals and book series. He is author of over 330 publications mostly published in rigorously refereed journals, including books, invited articles, review articles and chapters of books.

Plenary Lecture 3

Shock Reflection Problems and Gas Dynamics Equations

Assistant Professor Katarina Jegdic
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Abstract: We present mathematical analysis of shock reflection phenomenon using two-dimensional systems of conservation laws. Depending on the initial data, various types of shock reflection are possible, such as regular reflection (either supersonic or transonic) or Mach. We present proof of existence of regular reflection for the system of isentropic gas dynamics equations. The main idea in our approach is to rewrite the system using the self-similar coordinates. This leads to a free boundary problem for the subsonic state and the reflected shock. Existence of a solution is proved using the Holder estimates for the second order elliptic equations and various fixed point arguments. This work is joint with Barbara Lee Keyfitz (Ohio State University) and Suncica Canic (University of Houston).

Brief Biography of the Speaker:
Katarina Jegdic received B. Sc. degree in Mathematics from the University of Novi Sad, Serbia, in 1997. She obtained M.S. degree and Ph.D. degree in Mathematics from the University of Illinois at Urbana-Champaign, USA, in 2000 and 2004, respectively, after which she held a postdoctoral position at the University of Houston, USA. She is an assistant professor at the University of Houston - Downtown since 2006. Her research interests are in mathematical and numerical analysis of systems of conservation laws with applications to aerodynamics.

Plenary Lecture 4

Integrating the Cluster Analysis and Fuzzy Analytic Hierarchy Process with Dynamic Programming Approach for Determining the Optimal Sustainable Community Management Decisions

Associate Professor Kuei-Yang Wu
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Abstract: The understanding of the development changes of urban and rural communities and integrated research are very important and urgent tasks nowadays. Currently, 43% of the population in the world is living in urban areas. The percentage is expected to reach 60% in 2030. The rapid increase in the urban population has caused complex changes in the development of urban and rural communities. Generally, when doing researches on sustainable communities, the methods applied are statistical methods such as factor analysis and fuzzy analytic hierarchy process, or top-down urban and rural development planning to develop sustainable strategies. The management strategies with the features of “localization” which should be considered when promoting solutions related to community development and “efficiency” which changes with time are usually ignored. In this research, for the above-mentioned issues, community development strategies are considered, and opinions from experts, management decision makers, and residents are included as updates, so decisions can be made dynamically. Therefore, under the objectives of “economics, environments, society, and resident awareness”, sustainable communities can evaluate each other and give each other feedbacks to come up with the best decisions, in order to construct a dynamic cluster model for determining the optimal sustainable community management decisions.

Brief Biography of the Speaker:
Wu, Kuei-Yang was born in NanTon, Taiwan. He received M.Sc. from the Department of Architecture, Tunghai University, Taiwan, and Ph.D. from the Department of Civil Engineering, National Central University, Taiwan. He is an associate Professor in the Department of Architecture, National United University, Miaoli, Taiwan. He has highly research interests in architecture design teaching method, and green community. He authored or co-authored over 40 scientific papers published in reviewed journals or presented at international conferences.

Plenary Lecture 5

On Thermal Equilibrium, Optimal Chemical Composition and Residual Stresses during Quenching of Steels

Dr. Nikolai Kobasko
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Abstract: Hardening of steel is very important technology when alloy elements are dissolved in austenite during equilibrium establishment at high temperatures (800 – 1000oC). Then steel parts are rapidly cooled by water, water jets, oils, polymers and other liquids to room temperature where again new thermal equilibrium is established. When hardened through, often cracks are appearing due to tensile residual tresses are formed at the surface. To prevent crack formation, slow cooling in oils is widely used. During slow cooling material is not enough strengthened, that is why more alloy elements are added to the steel to provide needed strengthening. In the plenary lecture principally new approach of steel hardening is proposed. It is based on generalized equation for cooling time evaluation which allows calculating time of transition from high temperature equilibrium to room temperature equilibrium. The equation also calculates appropriate interruption time to provide optimal quenched layer. Using the generalized equation and CCT diagrams, the method for optimizing chemical composition of steels is developed to obtain optimal residual stress distribution throughout the section of steel part. The advantage of this method consists in the opportunity to use plain carbon steels instead of expensive alloy steels and calculate ideal critical size for a big variety of geometries on the basis of using respective CCT diagrams which are used at optimizing chemical composition of steels. It is discussed in detail optimal depth of hardened layer which provides high compressive residual stresses at the surface and not big residual tensile stresses in the core. Simultaneously during intensive quenching, the superstrengthening of a material in outer layers is occur. The method allows developing the new technologies to save materials, increase service life of steel parts, and use environmentally friendly liquids, just plain water, as a quenchant. The service life of steel parts increases due to high compressive residual stresses at the surface and improved mechanical properties. Taking all of these facts into account, a new approach for hardening of steel parts in the heat treating industry has been developed and applied into the practice.

Brief Biography of the Speaker:
Dr. Nikolai Kobasko received his PhD from the National Academy of Sciences of Ukraine in 1969. He is a leading expert on quenching and heat transfer during the hardening of steels. He is the author and co-author of more than 250 scientific and technical papers, several books and brochures, and more than 30 patents and certificates. In 2004, Dr. Nikolai Kobasko received the Da Vinci Diamond Award and Certificate in recognition of an outstanding contribution to thermal science. Dr. Nikolai Kobasko is Co-Editor of the WSEAS TRANSACTIONS on HEAT and MASS TRANSFER and is a member of Editorial Board for International Journal of Mechanics (NAUN) and Journal of ASTM International (JAI). He was the Head of the laboratory of the Thermal Physics Institute of the National Academy of Sciences of Ukraine. He is co-founder of two consulting companies: IQ Technologies Inc. Akron, USA (1999) and Intensive Technologies Ltd, Kiev, Ukraine (2000). The aim of both companies is material savings, ecological problems solving and increaing service life of steel parts. In 2009 for substantial and innovative contributions to thermal science and heat treating technologies, including development of novel quenching methods and application of computational models to thermal processes Dr. Nikolai Kobasko was elected as ASM International Fellow (FASM). At present he is the Director of Technology and R&D of IQ Technologies Inc., Akron, USA and also President of the Intensive Technologies Ltd., Kiev, Ukraine. More information is provided in http://www.intensivequench.com and http://www.itl.kiev.ua.

Plenary Lecture 6

Theoretical Contributions Regarding Establishing Thermal Balance at Machining by Grinding

Professor Constantin Buzatu
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Abstract: In the paper is shown a theoretical study regarding the manner in which the quantity of heat that result during grinding process is transmitted to the technological elements and the influence of thermal deformations on the dimensional accuracy of workpieces.
Also, are distinguished experimental data regarding the influence of cutting speed on the temperature in machining zone in the case of different cutting processes.

Brief Biography of the Speaker:
Constantin Buzatu is Professor at the Faculty of Technological Engineering and Manufacturing Technology Department of Transilvania University of Brasov, Romania. He graduated in 1972 and he obtained his Ph.D. in the field of accuracy of machining processes. His research interests are in Manufacturing engineering processes, Automation in industry, Performance measurement and management, Education technology. He is author and co-author of seven books and more than 150 papers in national and international conferences. Also he has been research manager for several research grants from Ministry of Education of Romania, and for contracts with factories in industry to introduce new technologies in producing workpieces and to improve their reliability. He was member of technical program committee of some conferences and chairman of local and international conferences. He has been scientific reviewer for International Conferences and independent evaluator for Grant National Competitions.

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